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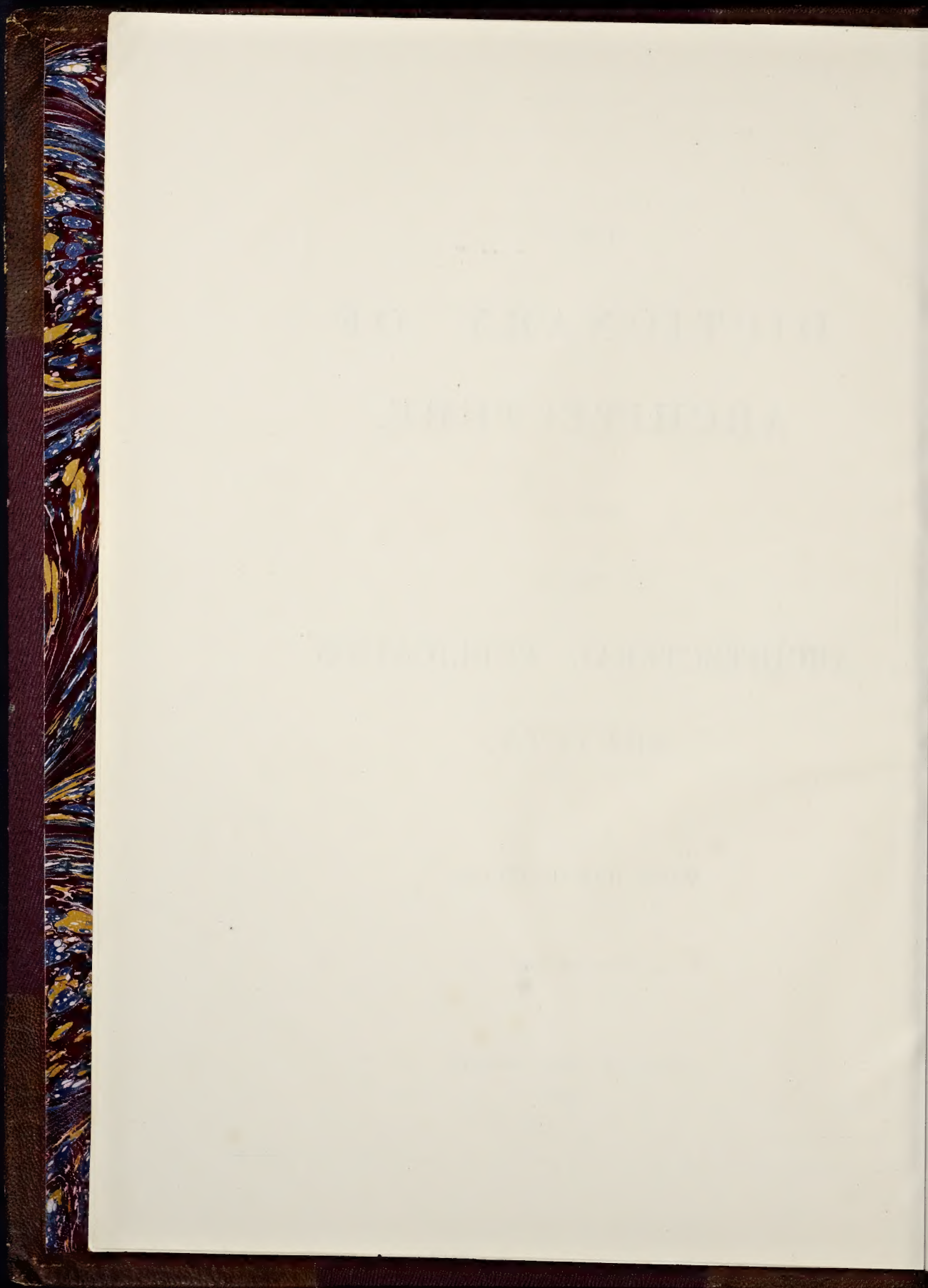
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# DICTIONARY OF ARCHITECTURE.

## CABI

**CABACALLI.** The native name for a fine, close-grained, moderately hard, and rather heavy wood of the country adjoining the river Demerara, British Guiana. Its bitter taste defends it from worms, and its planks, which must be fastened with copper nails, last well under water. It will square from 12 to 16 ins. or more, and from 40 to 45 ft. in length. 71.

**CABANEL** or **CABANELL, JUNIOR** (RUDOLPH), born 1762 or 1763 at Aix-la-Chapelle, resided from an early age in London, where he designed the stage for the old Drury Lane theatre; the Royal Circus, afterwards called the Surrey, theatre, when rebuilt in 1805-6, and called at that time the most perfectly constructed theatre in England; the Coburg, now the Victoria, theatre, 1816-18; the roof known by his name; and numerous machines. He died 4 February 1839; CIVIL ENGINEER *Journal*, ii, 118.

**CABBAGE TREE PALM.** A timber of North America, see CHAMAEROPS.

**CABBAGE WOOD.** The name used in the dockyards for HEISTERIA or PARTRIDGE WOOD. The bastard cabbage tree is described under ANDIRA.

**CABBLING**, more properly SCABBLING.

**CABER.** A Scottish term for a rafter. A north country term for the lath on which thatch is laid. 8.

**CABEZAS** (JOSEF DE LA), born 3 April 1709 at Enguera in the province of Valencia in Spain, took in 1729 the name FRANCISCO in the Franciscan monastery de la Corona in that city, finished the monastery of the order at Alcoy, and built another at Alcira. He designed the fine church and convent of S. Francisco el Grande at Madrid, the first stone of which was laid 8 November 1761: but the works were stopped in 1768. He died in his convent 19 August 1773. 28. 66.

**CABIN** (Fr. *cabane*). A word employed by old English writers for a dark lodging or small room, which in Great Britain is distinguished as a dwelling from a cottage or the present bothie by consisting of a single room, and from a hut by having a regular roof, and being turfed on the sides and top, or thatched like the BOTHIE or Scottish cabin of former times, which was five or six feet in height to the top of the walls, constructed of large turfs called *divots*, with an opening termed a *bole* at one end for light, and a roof of poles carrying turf or heather, with an opening in the middle for the escape of smoke. The ice-cabins of the Esquimaux, and the metal and wooden houses of modern armies and emigrants, offer examples of cabins built with other materials. MAZOIS, *Ruines de Pompeii*, fol., Paris, 1812-35, ii, 5, 34, gives an illustration of one of the many sepulchral urns, made of terra cotta, considered to represent the cabin of the first inhabitants of Latium.

**CABINET** (It. and Sp. *gabinetto*; Fr. and Ger. *cabinet*). The private audience-chamber of a prince or minister. A com-

## CABL

plete suite of business rooms formerly consisted of a hall, a chamber with an antechamber, and a cabinet with an ANTE-CABINET or *salle d'assemblée*; but in palaces the cabinet had two or three other rooms attached to it, such as a study or library (Fr. *arrière-cabinet*); a closet (Fr. *serre-papier*) sometimes placed over it with a concealed staircase; and an inner chamber or private room (Fr. *cabinet-secret*); and it should be observed that the French still distinguish between the *cabinet de travail* or *des affaires*, and the *cabinet d'étude*. The French word *cabinet* is often correctly translated by the word 'closet', whether as a private oratory, a dressing-room, or a privy.

Sometimes the word cabinet is used to denote a room or rooms containing a collection, whether private, or else public and very precious, or not open to general inspection. 4. 25.

Hence the term cabinet is also applied to a BUFFET or to a chest of drawers forming part of the architectural decoration of a gallery, chamber, or other room, and appropriated to the preservation of valuable articles. The *BUILDER Journal*, xi, 76, contains notes on the impropriety of employing the more resinous firs and pines, as well as juniper (which yields the wood usually called *cedar*), in the construction of drawers, and therefore of cabinets, for the reception of objects of natural history, medals, and similar articles: white American fir is said to be harmless: oak is injurious to copper medals.

Gardeners also give the name to an open summer-house, which may be of a square or round form, and either employed alone, or forming a kind of saloon in that long gallery which is properly called an ARBOUR. 2. 13.

**CABINET WINDOW.** A sort of window frequently used for shops about the beginning of the nineteenth century; and in a few cases for villas and cottages of pretension. Its plan is given in fig. 9 of the wood cut, *s. v.* BAY WINDOW.

**CABLE MOLDING** (Fr. *cable, tore tordu, torsade*). A convex molding, carved to resemble a rope, used in the works of the later Roman architects, as A, in the Corinthian order of the thermæ at Nîmes, in which the shaft springs from a row of acanthus leaves above the base, CLERISSEAU, *Antiquités*, fol., Paris, 1778, pl. 38; and in those of the later period of the Romanesque or Norman styles, as B, in the church of S. Georges at Bocheville in France, and in many parts of England; the rope is frequently shown less tightly twisted, so that the diagonal



lines are less upright. The billeted cable, c, on the Jews' House at Lincoln, is rather a ribbon: the variation, d, is from Charney in Berkshire; and a rope round a pole, e, is seen at Wimboltsham in Norfolk.

**CABLING** (It. *rudente*; Fr. *rudenture*). A decoration to



the shaft of a column, consisting of a baton or reed rising from the concave surface of a flute, the most prominent part being in the same surface with that of the fillet on each side. A column or pilaster thus treated, as in the arch of Constantine at Rome, and in the instance shown in STUART, *Antiquities*, fol., London, 1830, iv, *Antiquities at Athens and Delos*, p. 25, pl. 4, fig. 14, 15, is said to be cabled, or cable-fluted. The cabling is seldom carried up higher than a third, and frequently less than a sixth, part of the shaft. Cables in relief without fluting are to be seen on some pilasters in the chiesa della Sapienza at Rome. For Mediæval examples, see FLUTING. 1. 13.

CACCINI (GIOVANNI), son of Michelagnolo Caccini, was born about 1562. He became a pupil of G. A. Dosio, and succeeded to Scamozzi as architect of that Strozzi palace commenced by Buontalenti (one of his doorways is given by RUGGIERI, *Scelta*, 4to., Florence, 1755, ii, 23, 24); designed the high altar of the church of S. Spirito (1590-1600); the loggia with arches on columns of the Corinthian order in Sirena stone to the front of the church of the convent of the Annunciation (1601-4); the oratory of the Pucci family in the same church (1604-15); the pavement in its piazza (1604-7); and many chapels and tombs in Florence, where he died 17 March 1612, and was buried in the church of Sta. Maria Novella. GRANDJEAN and FAMIN, *Architecture Toscane*, fol., Paris, 1846, pl. 66, 76. 3. 33.

CACERES NUEVA. A city in Lussón, one of the Philippine islands, which was made in the sixteenth century the seat of a bishopric. It has a cathedral dedicated to S. Juan Bautista, a parish church, a Franciscan monastery, an episcopal palace, and an elegant government house. 50. 96.

CADACHIO, in the island of Corfu, possesses a hexastyle peripteral temple of the Doric order, discovered in 1822, illustrated by RAILTON, in the Supp. volume to STUART, *Antiquities*, fol., London, 1830.

CADEBY STONE, obtained near Doncaster in Yorkshire, is a friable magnesian limestone with suboolitic grains, of a cream colour, and in beds 4 ft. thick. It has been used at Messrs. Day and Martin's, Holborn, London, and in almshouses at Edgeware. REPORT of the Commissioners on Building Stones.

CADIX or CADIZ (It. *Cadice*). A seaport city in the province of the same name in the kingdom of Seville in Spain. It is about twelve furlongs square, surrounded by thick and high walls having five gates, of which the best are the *puerta del tierra* (designed in 1784 by Torcuato Cayón) with its barrack, and the *puerta del mar*. The streets are well paved, lighted, and drained: the houses, of freestone, from 50 to 60 ft. in height, having three or four stories, the fronts decorated with pilasters, vases, balconies, etc.; the most remarkable are those called the Gargollo, the Lasqueti, and the Gremios. In the middle of each house is a small court enclosing a tank, as there are no wells of good water; the roof is flat, with a belvedere, and has a parapet with posts or pillars for the ropes of awnings. An old aqueduct is allowed to remain unrepaired, and water is daily brought in boats from the town of Sta. Maria.

The old cathedral, built 1597, has since 1838 been the parish church of Sta. Cruz; it is small, but one of the best and oldest buildings in the town: the new cathedral is also called Sta. Cruz; it is about 289 ft. long, 205 ft. wide, and 179 ft. high from the pavement; the transepts are 178 ft. 6 ins. long; the circular *presbiterio* or *capilla mayor* is 57 ft. in diameter; and the two towers are 196 ft. 6 ins. high. The first stone was laid 3 May 1722; but the design, with a Corinthian order made by Vicente Acero, was altered by Jose and Gaspar Cayón and their successor Torcuato Cayón, under whom the mass of the work, lined with white marble from Genoa, was erected: he remarked in one of his reports that even then the white marble, having been exposed to the nitrous atmosphere, had lost its whiteness and become "*hierro mohoso*", iron-molded. This building was continued by Miguel Olivares, and after 1789 by Manuel Machuca, who left it incomplete, as it remained until a

fire in 1832. The necessary repairs and finishings were nearly completed in 1838; the new sacristy and the lantern tower were then unfinished. This edifice is considered remarkable for the abundant employment therein of coloured marbles; for the pavement; for the elegance of the *presbiterio*; for standing north and south; for having the nave nearly filled by the choir; and for the vaulted ceiling of its circular crypt or *panteon*, 54 ft. in diameter, but rising only 3 ft. 6 ins.: JAVIER DE URRIETA, *Descripcion Historico Artistica*, 1843. The church of S. Jose or *El Estramuro*, of an Ionic order with two towers, and that of S. Pablo of a Doric order, were both built in 1787 by Torcuato Benjumeda, from the designs of T. Cayón; that of the Rosario, also of a Doric order; those of la Cueva, la Merced, S. Agustín, and the Capuchins, and the oval chapel of an Ionic order of S. Felipe Neri, with an elliptic cupola, are the best of the twenty-five churches and chapels, while those of S. Francisco, el Carmen, the Descalzos, and S. Antonio, are the worst; the portal of the latter is given in TAYLOR, *Voyage*, 4to., Paris, 1826. The chief public establishments are the *casas consistoriales*, 1670, of an Ionic order, with a belfry; the lighthouse, 163 ft. high; the custom house (*aduana*), finished by José Caballero 1764-70, with two large courts; the dockyard (*caracca*); the arsenal; the barracks; the officers' quarters (*pabellons*) of the engineers and artillery, which are the best modern buildings in the city; the prison (*carcel publica*), 228 ft. long, 114 ft. deep, in two blocks with a central façade of three arches, as many courts, and a handsome circular chapel; the *fabrica de cigarros* for 1290 workwomen; the *casa de misericordia*, 285 ft. long, 228 ft. deep, and 75 ft. high, with its church, both built by T. Cayón 1780, and two subordinate buildings, for 1000 persons; four other hospitals; two theatres, of which one called *el Principal*, built by T. Cayón 1762-84, holds 1400 persons; the *academia de nobles artes* in the monastery of S. Francisco; several large public schools, including the *seminario* in the Jesuit college, of which the chapel was designed by Bartolomé Bustamante (1542-65); and the new *escuela del comercio*. OROSCO, *Historia*, 4to., 1845; WELLS, *Pict. Antiq.*, 8vo., London, 1846, p. 308. 85.

CADMIUM. The name, given by PLINY and other writers to an ore of zinc, is now appropriated to a metal having crystals that are regular octohedrons. It occurs in some zinc ores; is volatilized in the furnace, collecting on the roof as a crust, called *cadmia*, and contains from ten to twenty per cent. of cadmium. It is ductile into a fine wire, easily malleable into thin plates, harder and more tenacious than tin, which it resembles in colour; marks like lead, takes a fine polish, does not tarnish quickly, and has been suggested as superior to tin for a coating to other metals. Nitric acid is its best solvent. The cadmium of commerce is the brown oxide brought from Silesia in Prussia. The salts of cadmium are not affected by a tincture of galls; but zinc occasions in them a precipitate of the metal cadmium itself. W. H.

CADMIUM YELLOW. The artificially formed sulphuret of cadmium; formed by heating with sulphur the metal, or its oxide, as well as by passing sulphuretted hydrogen gas through a solution of the metal; it is insoluble in ammonia and in potassa: it has a bright yellow colour with a tint of orange, forms a yellow glass with borax, and as an oil pigment is considered superior in many respects to yellows from lead. 48. 104.

CADUCEUS. The staff, rod, or mace carried by the Grecian heralds and ambassadors. It was originally the emblem of peace, an olive branch, wreathed with a *stemma*, probably a bundle of white wool; the twigs were afterwards developed into the sacred snakes (in allusion to the fable that Mercury, the messenger of the gods, separated with his wand two combatant snakes, HYGINUS, *Astron.*, ii, 7; MACROBIUS, *Sat.*, i, 19): garlands appear to have been sometimes added; and a pair of wings, indicating expedition, was subsequently affixed to the top of the staff which became an attribute of Mercury. AARON'S ROD.



CÆMENTARIORUM OPUS. The late Latin term for masonry, especially of rough rubble work.

CÆMENTITIA STRUCTURA. The term used by VITRUVIUS, ii, 8, for masonry of two sorts, which according to their appearance were distinguished as OPUS INCERTUM or *antiqum*, and OPUS RETICULATUM.

CÆMENTUM. A Latin term frequently misunderstood on account of the similarity of the English word cement. It is said by PITISCUS, *Lexicon*, s. v., to be derived from *cædere* to cut, and seems to have been used for any small piece of stone, such as the shivers (It. *bissiarìa*) cut or knocked off a larger block; VITRUVIUS, i, 2; ii, 4, 7, 8; vii, 6; CICERO, *Orat. pro Milone*, 27, and LIVY, xxi, 11; but it occurs in CICERO, *Ep. ad Quint. Fr.*, iii, 9; *De Divinatione*, ii, 47; and in VITRUVIUS, i, 5, 6, viii, 7, as a general term for stone of such character.

CAEN (the Latin Cadetum and Cadomus). The capital of the department of the Calvados, and formerly of the province of the Basse-Normandie, in France. It is celebrated for two Benedictine monasteries, the modern buildings of which were erected by G. de la Tremblaye, 1704-26; these are the *abbaye aux dames*, converted into a model hospital in 1823, with its church commenced 1064, and dedicated in 1066 to the Holy Trinity; the towers above the buttresses were rebuilt about 1704; and the *abbaye aux hommes*, now the *collège*, with its church commenced in 1066, and dedicated in 1077 to S. Etienne; on the west side of its court is a school in a building of the fourteenth century; RAMÉE, *Histoire*, 12mo., Paris, 1843, gives a plan of this church as it existed before the choir was rebuilt at the end of the twelfth century, by Guglielmus de Caen, and the chapel of a Decorated Gothic period (1315) on the north side of the nave. The church of S. Nicolas, with apses to choir and transepts, is perhaps the oldest building of the Romanesque style in all its purity in France, for it probably was built before the two above-named; it has been converted into a stable and granary: the church of S. Pierre, standing north and south, has a choir and part of the nave dating 1260, and the rest of the nave with the tower 1308; the great porch is said not to have been finished until 1384, because in a record of that year it is called the *portail neuf*, it was restored and ornamented with statues in 1608; the north aisle of the nave was erected 1410, and the south aisle some years later; the apse, considered a fine specimen of the *style de la Renaissance*, and the vaulted roof of the choir and its aisles were erected by Hector Sohier in 1521: S. Gilles, with a Romanesque and Transitional interior, and an elaborate Pointed exterior; S. Sauveur, in a Pointed style, and a Renaissance apse; S. Jean with the porch, first tower, and nave of the fourteenth, but the choir and transept of the fifteenth, century; Notre Dame in various styles, with its apse of S. Eustache 1600-1700; S. Sauveur du Marché, in the Flamboyant and Renaissance styles, with a spire erected 1605; the choir 1530-46, is now a corn-market; and seven or eight other churches; a chapel, which was also the court of exchequer, in the razed castle; the remains of the exchequer chamber or treasury in the rue S. Jean; the hôtel de ville, and the hôtel de la prefecture in an Italian style; the *place* de S. Pierre, 1629; the hôtel de Vallois, built in a Renaissance style by Italians in 1538, and now containing the bourse and the chamber of commerce; the palais de justice, or law courts, of an Ionic order, 1770; the custom-house, and other usual state, municipal, and educational establishments, especially the palais de l'Université, 1701, and the new Collège des Arts; the theatre; the abattoir; the suburban château de Calix, commonly called the *tour de gendarmerie*, from two statues placed between the cops of a battlemented parapet to one of two towers connected by a crenellated wall (this building, which appears to have been redecorated if not rebuilt about 1600, is given by LABORDE, *Monumens*, fol., Paris, 1816); and the old Abbaye d'Ardenne, with a fine gate-tower, magnificent stables, large buttressed barn, and beautiful church, WHEWELL, *Architectural Notes*,

ARCH. PUB. SOC.

8vo., Cambridge, 1835, p. 189-193. The proximity of the church towers and spires; the private houses like the hôtel de Bureau in the rue Ecuylère, 1450-94; those in the rue S. Pierre, and the carved gables (the timber buildings were all probably erected by the English, 1418-48, when the quarries had become royal property) give a peculiar appearance to this town.

At Vaucelles, a fauxbourg of Caen, the church of S. Michael has a Romanesque tower and later body, with a north porch and attached chapel dating about 1380; about eight miles north of the town is the celebrated château de Fontaine-le-Henri, 1500; and ten miles north-east of Caen is the church of Than, 1060. These with many of the buildings above mentioned, together with the ducal palace (as it is called) near S. Etienne (1260), are given in BRITTON, *Architectural Antiquities of Normandy*, 4to., London, 1828. DE LA RUE, *Essais*, 8vo., Caen, 1820; JOLIMONT, *Desc. du Calvados*, 4to., Paris, 1825; DONALDSON, paper read at the Royal Institute of British Architects, 24 January, 1848, in the *Builder Journal*, vi, 51, 63, and in *Civil Engineer Journal*, xi, 94; GODWIN, in *Builder Journal*, vi, 470, 481; DAWSON TURNER in COTMAN, *Arch. Antiq. of Normandy*, fol., London, 1822; BAUZEITUNG *Journal*, series i, pl. 671. *Le Moyen Age*, etc., illustrates the church of S. Etienne, pl. 48, 254, 306, S. Etienne le Vieux, 261, and S. Pierre, 207, 283-4, 379, the external staircase of Notre Dame, 222, the tour des gendarmes, 140, and the timber houses, 393; DE CAUMONT, *Abécédaire*, etc., 8vo., Paris, 1853, 3rd edit.; HIPPEAU, *L'Abbaie de S. Etienne*, 4to., Caen, 1850, contains a list of works referring to Caen.

CAEN (GUGLIELMUS DE) executed, about the close of the twelfth century, the choir of the church of S. Etienne at Caen; DUCAREL, *Anglo-Norman Antiq.*, fol., London, 1767, p. 57.

CAEN STONE. A building-stone obtained from the great oolitic series in and around the town of CAEN. Although it was largely employed in England before 1307, yet it is perhaps first met with in documents after that period, as in the accounts at the king's Remembrancer's Office for the works at Westminster. DUCAREL, *Anglo-Norman Antiquities*, fol., London, 1767, p. 97, cites documents dated 1418, by which the quarries of Vaucelles and Calix were annexed to the royal domain; and stone from them was granted, as also in 1422, to Shene priory. Similar documents, which prove that Westminster abbey was supplied with stone from Caen at the same time and in 1457, indicate also one cause of its disuse in England; as after 1448 (when Normandy was finally lost to this country) safe-conducts, which were not easily obtained, were required for the traffic. RYMER, *Fœdera*, fol., London, 1704, xi, 452, gives a license dated 1460, for importing Caen stone to Westminster abbey. In 1582 there was a duty of 6s. 8d. per ton on this stone. DUCAREL further observes that in his time the exportation of it from France was prohibited; its use was not resumed here until at a comparatively recent period in the present century. These ancient permits show that the stone of the mediæval buildings of Caen was obtained from the abandoned quarries on the right and left banks of the river, situated to the east of the town, directly upon the navigation: and their number and extent prove the constant and large resort to them. There are quarries of this description at S. Julien, near the citadel; in the quartier S. Gilles, under l'abbaye aux Dames; at la Garenne and la belle Porte, in the commune of Héronville; and at Mondeville: whilst the citadel itself appears to have been built of the stone obtained in the excavation of the ditch. The Caen stone now generally used is obtained from the quarries at Allemagne, a small village on the right bank of the Orne at the gates of Caen, or from those of S. Germain de Blancherbe, commonly called la Maladrerie, the commune immediately adjoining that city on the left bank.

The Caen stone of commerce is of a pale yellow colour and of a loose open grain, which, when freshly-quarried, soils the fingers like chalk, and is very friable. In many cases it appears to have lost its oolitic character; and in others it is harder and



more compact, being entirely formed of a species of lamellous spath, without any trace of oolites; the latter appearance is, however, principally to be observed in the beds which are worked between Caen and Falaise: at Allemagne and the Maladrerie the former prevails. Near the surface the beds are covered by a considerable thickness of fragments of the same nature as the stone itself, mixed with flints, sand, and clay. The whole formation, moreover, contains many flints, either in the form of isolated black nodules, or deposited in regular layers separating the beds of workable stone. Neither the Allemagne nor the Maladrerie quarries appear to have been opened for any length of time. The latter are worked by means of shafts, in which the depth of each bed can be accurately ascertained: the following account is therefore founded upon them rather than upon the Allemagne quarries which are worked from headings, in which the succession of the strata is similar, or upon the beds of the old quarries, which are perfectly analogous to those at la Maladrerie. After passing through about a foot in thickness of vegetable soil and a series of highly-fissured beds about 3 ft. 6 ins. deep, a second series of beds of broken stone of larger dimensions is met with, and in it other beds apparently sublamellar and of a silicious carbonate of lime, passing occasionally into chert, are intercalated; the total thickness of this series varying from 13 ft. to 26 ft. Below this occur what are called *les bancs de bittes*, eight in number, of variable thicknesses (between 11 and 26 ins.), or 18 ins. on the average, and separated by layers of flint 2 ins. thick. These are succeeded by the *banc galez*, or, as it is called at Allemagne, the *banc cloutier*: it is 2 ft. thick, and usually forms the ceiling of the modern quarries. The stone of this bed is tolerably hard, but it is seldom used on account of the number of flints it contains. In the old quarries this bed formed the floor, and the building stone was obtained from the *bancs de bittes* above it. The *banc galez* is succeeded by what at la Maladrerie is called the *banc pineux*, and at Allemagne the *banc pourri*: it is about 3 ft. thick, but it is not adapted for building purposes, on account of the number of holes left by the decomposition of some organic bodies resembling the pholas. In some quarries the *banc galez* is succeeded by the *banc de chambrante*, 1 ft. 4 ins. thick; but in others this bed is wanting, and it merges either into the one above it, or into the *banc de deux pieds un quart*, about 2 ft. 6 ins. English, which yields a very good stone, disfigured unfortunately by the fossils it contains. Below this is the *banc rouge*, 1 ft. 10 ins. thick, of very bad quality and stained by ochreous iron ore, besides being traversed by numerous vertical vents; then the *gros banc*, 3 ft. 4 ins. thick, of very good stone, but likewise disfigured by the fossils. The *gros banc* is separated from the next bed, the *banc de fond*, by considerable quantities of quartz, calcedony, pseudomorphic silex, etc.: the *banc de fond* is of a closer, finer grain than the *gros banc*, and is usually from 1 ft. 6 ins. to 2 ft. 4 ins. thick. A bed called the *banc de 81 centimetres* is worked for the use of the immediate neighbourhood; but the stone it yields is of a very inferior quality.

Of the beds thus traversed the upper ones, called the *bancs de bittes*, yield a stone generally speaking of a much harder character, of a finer grain, and presenting a more crystalline appearance than that obtained from the lower beds. Care, however, is required in its selection; for the texture is far from being uniform, and the small size of the stones furnished by these beds would now be considered an objection. It was only with the advance of mechanical science that the beds supplying larger blocks were worked; it is remarkable that the portions of the churches and public buildings, which required stones of larger dimension than could be obtained from the upper beds of the oolitic formation immediately around the town, were executed in the Creully, Ranville, or Fontaine Henri stones—never in the stone obtained from the beds now worked exclusively for both the French and the English markets. In France, it may be added, it is customary to execute the exposed por-

tions of buildings principally constructed of Caen stone either of granite, or of the Cherence, Ranville, Creully, Courseulles, Fontaine Henri, or of the Aubigné stone. CALVADOS, *BUILDING STONES OF RICKMAN, Attempt*, etc., 8vo., Lond., 1848, app. xlv.

It may be that the mechanical difficulties of raising large blocks from the deep shafts of quarries, such as occur at la Maladrerie, or of transporting them to a distance, as in the case of those at Allemagne, were sufficient to account for the neglect of the modern sources of supply; but however that may be, it is still the fact that the beds, which made the reputation of the Caen stone, are not those worked at the present day.

A careful examination of ancient and modern buildings, both in France and England, proves that Caen stone is incapable of resisting the dissolving power of water charged with carbonic acid gas; and as rain-water, especially in our large towns, contains a considerable quantity of that gas, it is not desirable to employ this stone in any situation where water is likely to lodge, or even to be taken up by capillary action. In foundations, or in plinth courses, in strings, copings, cills, or weather-beds of cornices, Caen stone never ought to be used, but if employed, the projecting parts must be covered with metal. In upright walling above plinths, in the lower and sheltered portions of ornamental cornices, in all internal stone decoration, it can be employed economically and with safety. Like all regularly stratified deposits, the Caen oolite has a decided bedding, and it is therefore necessary to pay attention to placing it according to its natural bed, or "bedwise", as workmen say. It appears, from the state of some buildings at Havre, that the sea air is particularly destructive to this stone; and it is also generally believed that the Maladrerie stone is inferior to that of Allemagne.

Other and rather discrepant accounts are given by BRITTON, *Architectural Antiquities of Normandy*, 4to., London, 1828, p. 21; DONALDSON, in a paper read at the Royal Institute of British Architects, 24 January, 1848, given in the *BUILDER Journal*, vi, 51, and in the *CIVIL ENGINEER Journal*, xi, 94; GODWIN, in the *BUILDER Journal*, vi, 481, 493; SMITH, in the same work, vii, 25, 38, 67. G. R. B.

CÆRE (the AGYLLA of the Pelasgi). An Etruscan city situated about twenty-seven miles west of Rome, and now represented by (Cere-vetere) Cervetri, a village containing a palazzo Ruspoli, and a Gothic gateway in fortifications constructed in the fourteenth and fifteenth centuries; these last are built with blocks of stone taken from the Pelasgic walls. The tombs in the Etruscan necropolis, now called the Banditaccia, have no architectural fronts, but the interiors seem to represent contemporary mansions; consisting of a central hall surrounded by chambers lighted by windows from the roof; the ceilings have imitations of beams and rafters hewn in the rock. Some of them deserve especial notice; the grotto della *Sedia*, so called from an arm chair cut out of the rock close to the sepulchral couch, probably a representation of the *cella curulis* which was borrowed by the Romans from Etruria; another illustrated in GAILLHABAUD, *Mons.*, 4to., Paris, 1852, i, having two similar chairs; and the grotto del *trichinio*, with some remarkable paintings executed in distemper, are fully described by DENNIS, *Cities*, 8vo., London, 1848, ii, 17-63. The tombs called Regulini Galassi from the explorers who opened them in 1836, contained numerous articles in a semi-Egyptian style, illustrations of which are given by GRIFI, *Monumenti di Cere*, fol., Rome, 1841; CANINA, *Descrizione di Cere*, fol., Rome, 1838. In the neighbourhood are the tombs called the colli Tufarini at Monterone, with doorways narrower at the top than at the sill; the fortress built by the Orsini family, 1470, at Cerenuovo; and that at Sta. Severa, occupying very nearly the site of Pyrgos, supposed to have been the port of Cere, but this port was more probably at Palo, the ancient Alsium. 28.

CÆRULEUM. The Latin general name for a blue pigment said to have been a sand supplied from Egypt, Scythia, and Cyprus, which according to DELAFOSSE was AZURITE, the blue



hydrocarbonate of copper. THEOPHRASTUS, *De Lapidibus*, states that the sand from the two last-named countries was natural, but the Egyptian artificial; that this was the best as a pure powder, but that the Scythian better suffered levigation. In this last opinion PLINY, *Hist. Nat.*, xxxiii, 57, concurs, adding that four tints were made from it by that process, but that the Cyprian was preferable; that *lomentum* was the name given to the cæruleum when so triturated and washed, which gave a lighter blue pigment, and that the tints were lightened with earth (*creta*), as they would not mix with lime (*calx*). He states, xxxv, 31, so much also of the cæruleum itself; but DAVY, *Philosophical Transactions*, 4to., London, 1815, p. 105, infers that specimens of cæruleum examined by him contained carbonate of lime. PLINY mentions *tritum* as the worst sort of lomentum; and notices as new the factitious blues from Armenia (lighter in tint than the cæruleum, xxxv, 28), from Spain and Puteoli, and also, as still more recent but equally good for windows (*i.e.*, for stained glass?) the *Vestorianum*, so named from its inventor, made in the time of Vitruvius at Puteoli, from the lightest portion of the Egyptian, and also called *coelon*. VITRUVIUS, vii, 11, states that this was made by heating strongly together sand, copper filings, and flos nitri; the nitrum of the ancients was therefore carbonate of soda, which would form a grit that was probably the pigment described by THEOPHRASTUS as invented by an Egyptian monarch. An Indian blue was as cheap as the cæruleum, but the lomentum and coelon bore a rather higher price. PLINY adds that the cæruleum was imitated by Eretrian earth tinted with a decoction of violets; this was done to imitate the *Sil Atticum*, according to VITRUVIUS, vii, 14; PLINY, xxxiii, 56.

CÆSALPINIA SAPAN, Sapanwood, Buckum, Bukkum, or Bookum wood. An East Indian wood of a red colour, occasionally used in cabinet work; it is imported in pieces about 3 to 4 ft. in length and from 1 to 3 ins. in diameter. 71.

CÆSAREIA. A maritime city in Palestine, founded by Herod the Great and described by JOSEPHUS, *Antiq.*, xv, 10, xx, 7, and *Bell. Jud.*, c. 21, translated by TRAILL, 8vo., London, 1847. Besides its aqueducts, mentioned by POCOCKE, *Descr. of the East*, fol., London, 1743-5, ii, 57-59, the fragments of its towers, and the substructures of its mole, over which are scattered the prostrate columns that once carried the terraced roof of its portico, there are the remains of the Christian cathedral built by the Crusaders.

CÆSAREIA. A city of Cilicia in Asia Minor. TEXTIER, *Desc. de l'Asie Mineure*, fol., Paris, 1839, ii, pl. 86-88, gives the tomb and mosque with the medresseh of Houen, a Mahomedan saint (1275-1350?). The corbelling as also the general design of the tomb are peculiar.

CÆSAREUM (CÆSAR), one of the family names of the Gens Julia assumed by Augustus as the adopted son of Caius Julius Cæsar, ultimately became an imperial title; hence Cæsareum might express temples raised in honour of Augustus and Rome, as at Pola and Ancyra; or of members of his family, as at Nîmes to Caius and Lucius Cæsar. SMITH, *Dict. of Ancient Geog.*, s. v. Alexandria, mentions a Cæsareum or Sebaste in that city as a temple to the Cæsars, where divine honours were paid to the emperors; and s. v. Beneventum, mentions a cæsareum, but explains the word in that case as to mean a curia or place for the assemblies of the local senate.

CÆSARIANUS, see CÆSARIANO (CÆSAR).

CÆSARODUNUM. The Latin name for TOURS in France.

CÆSAROMAGUS. The Latin name for BEAUVAIS in France.

CAGE (Fr. *cage*). The term formerly given to the external framework of any timber building; in this sense it is still applied to the wooden enclosure of millwork; and to the framework of a projecting or bay window: in a similar manner the enclosing walls of a staircase are called its cage, and the term is also applied to the entire carriage of a large bell. Wooden or iron cages used as prisons for petty malefactors in market-places

have given place to brick or stone rooms which have no importance. BELL CAGE. 2. 5.

CAGIGAL Y SOLA (JUAN DE), one of the followers of Juan de Herrera, erected at the beginning of the seventeenth century many buildings in the province of Asturias in Spain. 66.

CAGLI (the ancient CALLIS). A city in the Papal States in Italy. The modern town, dating from 1287-92, contains a handsome cathedral dedicated to the Virgin, four monasteries, and as many convents. The only antique remains are two small bridges. 96.

CAGNOLA (IL MARCHESE LUIGI), born at Milan 1762, became cavalier of the Iron Crown and chamberlain to the emperor of Austria. Having studied at Rome, he returned to Milan in 1781, and was employed to secure from further ruin the sixteen Corinthian columns of the ancient baths of Maximian, near the church of S. Lorenzo, the plan of which thermæ he had published in FUMAGALLI, *Antichità Longobardiche Milanese*, 4to., Milan, 1790, i, 152. He designed the *fabbrica* Zurla at Crema near Vajano, 1802, three catafalchi published as *Mausolei Visconti*, etc., fol., Milan, 1802, the porta del Sempione (Simplon), or as it has been called, the Arco della Vittoria, and della Pace, commenced 14 October 1807, of the Corinthian order in white marble, completed about 1836, described in the *Bibliotheca Italiana*, 1828, i, 3; the porta di Marengo or di Ticino or Ticinese, of an Ionic order in granite; the casino de' Nobili, 1815; and the chapel of Sta. Marcellina in the church of S. Ambrogio, all these last being in Milan; the circular campanile, 1824-9, at Urgnano, engraved in the APE DELLE BELLE ARTI, Rome, 1835, and the round church at Ghisalba finished 1836, both in the province of Bergamo; the church at Concorrezzo; the façade of that at Vivallo; and a great number of magnificent projects; besides the palazzo built for himself at Inverigo, upon the plan of Palladio's Villa Capri. The central *salone* is about 45 ft. in diameter; one portico, of which the pillars are caryatides, is capacious enough to receive carriages. He died 14 August 1833; a portrait is given in the BAUZEITUNG, 1838; Bianchi, Dordone, Gillardi, Peverelli and Vergani, were amongst his pupils. N. G(IRONI), *Necrologia*, 8vo., Milan, 1844. 14. 26. 28. 62. 84.

CAGLIARI (the Latin CALIARIS or CARALIS). The capital of the island of Sardinia. The old town was erected in the middle ages on the summit of a hill near the sea beach by the Pisans, who built the castle, to which a modern citadel has been added; three square towers; and the cathedral dedicated to the Virgin and S. Cecilia. The most remarkable buildings are the vice-regal palace; the university; the mausoleum of Martin, king of Sicily, 1406; the mansions of the nobility; and the sanctuary of S. Saturnino, 1119, covered like part of the cathedral with marbles, and having three subterranean chapels. The other chief buildings are the archiepiscopal palace, thirty-eight churches, thirteen monasteries and five convents, the Jesuit college, the *seminario*, and six other large educational establishments, several hospitals, the mint, the theatre, and the usual civil and criminal tribunals. The town is badly supplied with water, yet an ancient aqueduct is not kept in action. 96.

CAHAMILILE. A very hard, fine, close, even-grained, heavy wood of Ceylon. 71.

CAHER. The Irish term for a stone enclosure. Those of the first class are the most remarkable, and but ten of them are known to exist, one called the Grianon at AILECH in the county of Londonderry, and the other nine in the county of Kerry, the best preserved of which are Staigue fort, Bally-Carberry, Lisleilane, and Cahersivawn. That at Staigue fort is a wall nearly circular on plan, its longest internal diameter being 89 ft., its shortest 88 ft.; 13 ft. thick at the base, and at its greatest elevation 17 ft. high; the front face has a curved batter rather parabolic in its outline. The entrance doorway is of the form found in Cyclopean structures, as at Mycenæ; it is 5 ft. wide at bottom, 4 ft. 6 ins. at top, 6 ft. in height, and covered by



massive stone lintels. There are two cells constructed in the thickness of the wall; these are oval on plan, one 12 ft. by 4 ft. 8 ins., the other 8 ft. by 5 ft.; they are covered with overlaid arches, as in the galleries at Tiryns, and the treasury of Atreus at Mycenæ. The interior face of wall has ten ranges of steps crossing each other in an X form, by which the top is reached; they are taken out of the thickness of wall. The whole is surrounded by a ditch 26 ft. wide and 7 ft. deep. The masonry was constructed of the slate rock of the locality, and is an admirable specimen of dry work.

The caher at Bally-Carberry has no chambers in the thickness of the wall, but in the centre of the area there is a curious oval building, whose transverse section is a perfect pointed arch. At Cahersivawn the interior face of wall has several ranges of steps or offsets rising one over another as in an amphitheatre. The caher at Ailech has the Cyclopean doorway, the curved batter, and the internal flights of steps; it has also narrow galleries running half way round its circumference in the thickness of the walls, with converging sides and stone lintels.

The cahers of the second class are numerous throughout Ireland; they are field fortifications, and consist of a circular breastwork of rude uncemented masonry enclosing areas of from forty to two hundred feet in diameter, and having within them subterranean chambers artificially formed. ROYAL IRISH ACADEMY, *Transactions*, xiv; ORDINANCE SURVEY OF LONDONDERRY; WILKINSON, *Ancient Architecture, etc., of Ireland*, 8vo., London, 1845.

R. R. B.

CAHORS, sometimes called CHOORS (the Latin Cadurcum and Divona). The capital of the department of the Lot in France. It has three bridges, one of which, called the pont de Valendre, has a tower in the middle and at each end; it was built 1254-61, and is shown in GAILHARBAUD, *Mémoires*, ii, 130, and in three views by NODIER and TAYLOR, *Voy. Pitt.* (Languedoc), fol., Paris, i, pt. 2, pl. 57, who also give illustrations of the cathedral dedicated to S. Etienne, a nave without aisles but having two domes (described by BOURASSÉ, *Cathedrales*, 8vo., Tours, 1843, as being almost entirely in the style *Romano-Byzantine*), with a semicircular apse about 1200; its fine cloisters, and the choir (thirteenth century) and great portal with three western towers (fourteenth century) are in the Pointed style; the tower called that of pope John (1316-34); and a house in the style of *la Renaissance*. The hôtel de la préfecture, formerly the episcopal palace; the *seminaire*, now a barrack; the old chapter house or Carthusian monastery, formerly belonging to the Templars; the theatre; the public library; the obelisk in honour of Fénelon, 1820; and three convents, are also worthy of notice. CALVET, *Essais, etc., sur l'Ancien Quercy*, 8vo., Cahors, 1841. The Roman remains, besides those alleged to exist at the cathedral, are those of a theatre and of a building called the temple of Diana, both of which are illustrated by NODIER.

96.

CAIETA. The Latin name of GAETA, near Naples in Italy.

CAILLETEAU ( . . . ), called Laseurance according to his own signature, or l'Assurance, or de Lassurance, was a pupil of J. H. Mansard; he became architecte du roi, member of the Academy of Architecture at Paris in 1699, and contrôleur des bâtiments at Marly. He was more employed in Paris than any architect of his time; his works, engraved by BLONDEL, *Architecture Française*, fol., Paris, 1752, include almost rebuilding the hôtels de Pussort, afterwards Noailles (1704), in the rue S. Honoré, iii, 130; and d'Evreux, in the rue de Faubourg S. Honoré, iii, 156; the erection of the hôtels de Rotelin, afterwards Audier (about 1700), in the rue de Grenelle, i, 232; des Marets, afterwards de Luxembourg (1704), in the rue de S. Marc, altered in 1749 by Carpentier, iii, 95; de Maisons, afterwards Saucourt (1708), and the adjoining hôtel d'Auvergne (1708), in the rue de l'Université, i, 257-61; de Montbazou (1718), in the rue S. Honoré, iii, 143; de Neufchatel, afterwards Bethune, afterwards Châtillon (1708), i, 249, and de Roquelaure, afterwards de Molé (1722), i, 245, both in

the rue S. Dominique; he continued in 1722 the palais Bourbon, commenced by Giardini, and completed by Gabriel and Aubert, i, 265; commenced in 1724 the hôtel de Lassay, finished by Aubert, i, 270, and built the château de Petitbourg, situated twenty-four miles from Paris on the road to Fontainebleau, for the duc d'Antin; this, which was considered a model of distribution in its time, was destroyed before 1777: it was engraved by Mariette in six plates, *Bib. Reg. Maps*, lxvi, 15. BLONDEL, *Cours*, 8vo., Paris, 1771, gives the garden front of the hôtel de Noailles, iii, p. 114, pl. 18, with its details, ii, pl. 89; and the entrance front of the hôtel de Montbazou, which is severely criticized, iii, p. 449, pl. 70. He died in 1724.

5.

CAILLETEAU or L'ASSURANCE ( . . . ), the son of the above, succeeded his father as contrôleur at Marly, was admitted a member of the Academy of Architecture at Paris in 1723. Among the edifices designed by him was the château de Bellevue, 1748; he died in 1755. BLONDEL, *Cours*, 8vo., Paris, 1771, vi, 492; *Arch. Fran.*, fol., Paris, 1752, i, 232.

5.

CAIRN, CARNEDDE, CARNADDEN. A heap of stones raised in the form of a cone, pyramid, or hemisphere, in some instances like a boat or ship, keel uppermost. Cairns are of various dimensions, from 4 ft. perpendicular to over 100 ft., and from 12 ft. in circumference to 600 and 700 yards. They are supposed to have been the work of primitive races of men, erected for religious, sepulchral, or monumental purposes; they are found in all parts of the old world, and in North and South America; being numerous in Tartary, Nepal, Persia, Asia Minor, Thessaly, the Crimea, Norway, Sweden, Denmark, and the British Isles. In England they are usually called barrows; in Scotland and Ireland cairns or corrans.

Near Ardach, in the county of Perth in Scotland, is a ship cairn 182 ft. long, 45 ft. wide, and 30 ft. in sloping height, which contained a kistvaen enclosing a skeleton of gigantic proportions. At New Grange, near Drogheda in Ireland, is a cairn of an enormous size, being 80 ft. in perpendicular height, and 1,275 ft. in circumference; the entrance gallery, 63 ft. in length, is formed of upright stones at the sides, supporting stone lintels; at the end of the passage is a chamber nearly circular, 13 ft. in diameter and 20 ft. in height, with a high pitched domical vault formed of courses of overlaying stones, as in the Treasury of Atreus at Mycenæ. There are three other chambers or cells connected with the centre one; their dimensions are about 8 ft. by 6 ft. On some of the stones of the centre chamber are rude attempts at carving, consisting of spirals, scrolls, and other simple forms incised. A rude altar and rock basins, and some pottery, were found on its being first opened. Other remarkable cairns are situate at Knocknaree in Sligo; Cairnbar and Agh-na-Cloch-Mullen in Armagh; and Corranthier-na in Cork. PENNANT, *Tour in Scotland*, 4to., London, 1790; WILDE, *Beauties of the Boyne*, etc., 8vo., Dublin, 1849; WILKINSON, *Ancient Architecture of Ireland*, 8vo., London, 1845; HARCOURT, *Doctrine of the Deluge*, etc., 8vo., London, 1838; LEDWICH, *Antiquities of Ireland*, 2nd edit., 4to., Dublin, 1804.

R. R. B.

CAIRO (in Arabic Musr el Kahireh, "the victorious") has been the capital of Egypt since the year 973, in the stead of Fostat, called Old Cairo, distant from it about three miles, occupying the site of an ancient town called Babylon, and still showing remains of Roman work and the fine mosque of Amer.

Cairo, perhaps built upon the site of an Egyptian town called Louitkeshromi, is about three miles long and two miles broad. The flat-roofed houses are chiefly built of sun-dried bricks, but there are some stone mansions, in streets of which only a few are so much as ten feet in width. It is chiefly remarkable for the gates called *bab el Fotook*, *bab el Nasr* (1087-91), and *bab Zoayleh* (gate, 1092, two minarets, 1414); the tower named *boorg el ziffir* in the Saracenic walls, constructed about 1176; the citadel, erected about the same time, containing the palace and mosque built by Mohammed Ali, the mint, the arsenal, and a well with a winding staircase 280 ft. deep; seven palaces



within the walls, and four outside; the lunatic asylum, 1844; the new law courts; the hospital, with five hundred beds; the *mekkeas* or nilometer; the aqueduct, 1503-18 (see *Detached Essay*); the colleges, especially that of the dervishes, built 1174; and two bazars, el Khaleel (1292), and el Ghoreeh (1500), which are the best of the twelve leading markets; the hundred baths are not remarkable. Of the two hundred and forty mosques, and the hundred and sixty chapels, many contain the tombs of the founders or of their relations; the principal ones are that called el Azhar, and those of Ahmed ben el Tooloon, generally called the Djama Tayloón, 877; of sultan el Hakem, 1003; el Mansouryeh, built by sultan Kalaoon, 1286-96, with its *muristan* or lunatic asylum, containing a smaller mosque; of sultan Baybars II, 1306; of sultan Hassan, 1356, built of blocks from the pyramids at Ghizeh; of sultan Barkook, 1382-98; of el Moaiud or el Mowaiyah, 1412-20; and the two of the sultan el Ghoreeh, 1503-17: scarcely inferior to these are the tomb-mosques of caliph Saleh Eiyoub, 1250; of sultan Baybars I, 1266; of Mohammed the son of Kalaoon, 1294-9, with a peculiarly handsome minaret; of the Circassian Mamelukes, 1384-1517, outside the town, in the place called el Kaitbay, from the name of the sultan who erected in 1496 the principal building; and of the Mamelukes close to that of Mohammed Ali. Sixty of the three hundred *sebeels* or fountains, especially the two (1820-30) named after Toussoun and Ismail Pashas, sons of Mohammed Ali, are also remarkable: several have a free-school, *kouttab*, in an upper story. Nearly all the edifices above named to which dates are attached, and Joseph's Hall (i.e. the hall of Youssef Salah el Deen, or the Saladin of the Crusades), which has been destroyed, are given in HAY, *Illustrations*, fol., London, 1840; or in COSTE, *Arch. Arabe ou Monuments de Kaire*, fol., Paris, 1824; FORBIN, *Voyage*, fol., Paris, 1819; BIRCH, JONES, and GOURY, *Views on the Nile*, fol., London, 1843; and the *Description de l'Egypte*, published by the French Government, *texte*, v, 53, ix, 297, xviii, pt. 2, pp. 113-538, *planches*, E. M. i. There are twenty-seven churches and ten synagogues; and about twenty bridges with pointed arches; those called el Sebad (1270) and el Beysons are remarkable for the lions in their friezes. The mosques el Hassan, Tayloón, and Moiaud, are given in GAILHABAUD, *Monumens*, iii; and the bridges for the Cairo and Suez railway are given in the *BAUZEITUNG Journal*, series ii, pl. 562; in the *CIVIL ENGINEER Journal*, xvi, 424; and in the *ILLUSTRATED LONDON NEWS Journal*, 1856, p. 232.

CAISSON, formerly also written CASOON. A French word for a close framing of metal or timber (CRESY, *Encyc.*, pp. 236-8, 259, details, 423), sunk in water on a previously prepared bottom; a sluice should be provided so that while the structure is below the level of tidal water the box may if requisite be filled by the tide: when the structure is above the water, the sides may be removed. VITRUVIUS, v, 12, describes a mode of executing the foundations of a mole or other hydraulic building, which is sufficiently analogous in principle to the caissons of the early Italian engineer-architects, to warrant the assertion that their system was originally derived from the Romans. In the north-west of Europe caissons were little used until the time of LABELYE, *Description of Westminster Bridge*, 8vo., London, 1741. They were next applied about 1757 on a large scale in the construction of the bridge at Saumur, and in other important constructions by DE CESSART, *Description des Travaux Hydrauliques*, 4to., Paris, 1806. They are called COFFERS by SEMPLE, *Treatise on Building in Water*, 4to., Dublin, 1776; and were used for the foundation of portions of Ramsgate harbour by SMEATON, *Reports*, 4to., London, 1812. At the present day they are seldom employed; as it has been found by observation at nearly all the places above named, that foundations constructed in this manner are not secure from being undermined when upon light or easily moved soils; and the use of caissons is consequently almost exclusively confined to positions in which the subsoil is rocky. In the latter case, unless the bed upon which

the caissons are to rest can be dressed to receive them, it is preferable to employ caissons open at the bottom, and to fill them with concrete. When closed caissons are used, it is customary to commence the masonry in them before sinking them; but there is always a difficulty in performing that operation with such heavy bodies so as to maintain their perpendicularity. SGANZIN, *Cours de Construction*, 3 vols., 4to., and *Atlas*, Paris, 1839.

The ruinous effect of seating any structure on the timber bed of a caisson has led to the introduction of the COFFER-DAM; to the work by COULOMB, *Recherches sur les Moyens d'Exécuter sous l'eau toutes sortes de Travaux Hydrauliques*, 8vo., Paris, 1779; and still more recently to the diving-bell and its modifications, as described by BUSH, *On Sinking Foundations, etc., of Air-tight Caissons*, 8vo., London, 1845.

CAISSON and CASOON have also been introduced into the English language for a sunk panel in a soffit, but COFFER is the legitimate equivalent.

G. R. B.

CAITHNESS STONE. A dense, hard, and very durable flagstone, used to a considerable extent in Scotland for out-door pavements, and also now some years introduced into London under the denomination of Rockhill paving. This stone, 1½ ins. thick with sawn joints, is recommended in preference to Yorkshire stone 3 ins. thick for foot pavements, by Mr. Newlands, the borough engineer, in the *Report to the Health Committee of Liverpool*, given in the *CIVIL ENGINEER Journal*, xi, 279.

CAJAZZO. A city in the province of Terra di Lavoro in the kingdom of Naples. It contains a citadel built by the Lombards, a handsome old cathedral, dedicated to the Virgin, several churches and convents, a *seminario*, a college, and an hospital.

50. 96.

CALAHORRA (the Latin CALAGURRIS). A very ancient city in the province of Old Castile in Spain. It is remarkable for numerous porticos with semicircular arches; the three-ailed cathedral, dedicated to the Virgin, and belonging to the different epochs of 1045, enlargement 1132, capilla mayor (1485, replaced by another) 1570, round-ended choir with ailes up to the transept also 1570, additional chapels 1570-1700, and brick façade, principal and south portals, and chapel of the Epiphany, restored 1700-46; the four churches, and as many chapels; the episcopal palace; the *casa del ayuntamiento*; the Franciscan monastery, now a theatre; a prison; a school; the *casa fuerte* or the former founding hospital, that establishment having been placed in the former *seminario*; and the Carmelite nunnery, which is equal to any edifice of its class.

28. 50. 66. 85.

CALAHORRA (JUAN DE) erected 1485 the capilla mayor of the cathedral above named.

66.

CALAMANDER, or COROMANDEL WOOD, see DIOSPYRUS.

CALAMINE or ZINC SPAR. Native carbonate of zinc, which is raised to a considerable extent in Somersetshire, Flintshire, and Derbyshire, in Great Britain; in Silesia; in Belgium; and in the East Indies. It seems to have been called *cadmium* by PLINY and other writers. GMELIN, *Handbook of Chemistry*, 8vo., London, 1848; BRANDE, *Manual of Chemistry*, 8vo., London, 1848.

G. R. B.

CALATAGIRONE in Sicily, see CALTAGIRONE.

CALATAYUD. The second town in the province of Aragon in Spain. The upper or Moorish portion consists of caves cut in the rock; the lower town has upwards of twenty *plazas* formed by houses with very projecting cornices, the handsomest of which are the mansions of the Aparicio, Esparza, Heredia, and Muñoz families, and the unfinished palace of the baron de Wersag, 1800. The chief public buildings are two collegiate churches, S. Sepolcro, of a Doric order, with nave and ailes 120 ft. long and 64 ft. wide, and transepts finished in 1613 by Gaspar de Villaverde, its Pointed cloister and priory buildings (1156-1249) still remain; and Sta. Maria la Mayor, which was a mosque (as was also the parish church of S. Jago) before 1120, but now has a nave with ailes and transepts 150 ft. long and 100 ft. wide, with an octagonal brick



tower, and a portal erected 1525-8, by Juan de Talavera and Etienne Veray: these edifices afford fine specimens of church decoration. Of the eleven other churches the leading ones are S. Andres, a brick building with an octagonal tower; S. Pedro, the tower of which was destroyed in 1840 on account of its inclination (all these are in a Pointed style); S. Juan, of a Corinthian order, with a cupola; and S. Benito. Of the thirty oratories the best is N. S. de la Peña, 1343-1410; the splendid Dominican monastery, illustrated by VILL'AMIL, *L'Espagne*, fol., Paris, 1842, ii, 26, like the work at Guadalajara; the equally fine Dominican convent with a circular church 40 ft. in diameter, 1625; and the convent de las Salesas, of a Corinthian order, 1834, are the other important religious edifices. The *casas consistoriales* 1842, the *casa de la comunidad* 1800, the extensive and magnificent old castle, the episcopal palace, the barrack in the Franciscan monastery called la Merced (1718), the *seminario* of the Jesuits now a hospital, two other hospitals, and the theatre, are the chief public buildings. 28. 50. 66. 85.

**CALATHUS** (Gr. *κάλαθος*). A basket made of wicker-work, and gradually expanding upwards; used within doors for wool, and in the open air for fruit and flowers. The term is used for the bell of the capital of the Corinthian order by VITRUVIUS, iv, 1; and probably for the well known palm and lotus capitals of the Egyptians by CALLIXENUS, *Athen.*, v, 293. 6. 78. 79.

**CALCAGNI** (TIBERIO), born at Recanati (at Florence, VASARI), was a pupil of Buonarroti, whose ideas for the church of S. Giovanni dei Fiorentini (not in Florence, as in NAGLER, but) in the Strada Giulia, and for the Sforza chapel (1540-65), in the church of Sta. Maria Maggiore, both at Rome, were put into execution by Calcagni, at whose death the works were stopped; the first was ultimately finished by A. Gallei, and the second by Giacomo della Porta. 8. 68. 73.

**CALCAIRE GROSSIER**. One of the coarse calcareous building stones used in Paris for rubble and ashlar walling. They are obtained from the tertiary formation above the chalk, and are generally classed among the eocene deposits. The best in quality used for ashlar work is obtained at Conflans S. Honorine, l'Isle Adam, S. Neon, Meudon, etc. The best and the worst kinds are met with in the same quarry. 6. 8. 8.

**CALCAREOUS CEMENT**. A cement having lime for its base. As the term is usually applied it differs from ordinary mortar, so far as its physical characteristics are concerned, in its greater rapidity of setting and in the greater hardness it attains. So far as its chemical composition is concerned, the difference consists in the fact that it contains remarkably large proportions of the silicate of alumina in combination with the lime. The peculiar characteristics of the two varieties of calcareous cement—the *natural* and the *artificial*—are strongly defined and most important.

The Roman or *natural* calcareous cements used in England, are obtained by the calcination of the septarian nodules found in the London-clay formations at Harwich, Sheppey, the Isle of Wight, and the opposite Hampshire coast near Christchurch; or in the clays of the oolitic series of the Yorkshire and the Dorsetshire coast. The general composition of these nodules may be said to be nearly as follows:

	Sheppey.	Harwich.	York-shire.
Carbonate of lime . . .	55	49	62
Clay . . . . .	38	47	34
Oxide of iron . . . .	7	3	4

whilst the Dorsetshire septaria may be taken to correspond very closely with the latter material. After a comparatively low degree of calcination, the stone loses about one-third of its weight, and being then ground and put in casks, so as to exclude it from the effects of the atmosphere, it is delivered for use. The *natural* cements of the lightest specific gravity are usually the best; and it is found that the finer they are ground the better they act. The time of setting, which should not be allowed to commence until the evolution of heat has ceased, depends greatly upon the quantity and quality of the water

used, and the proportions of sand mixed with the cement; for if too much water, sea water, or much sand be introduced, the setting will be found to vary from six minutes (the time required by the best neat cement), to one hour and twenty minutes (the time required when two parts of sand are used to one of cement); in both cases it being assumed that the experiment is carried on in the open air. If the cement-mortar last described be immersed in salt water, it will require not less than twenty-four hours to harden. The average resistance of the neat natural cement to an effort of rupture is equal to 54 lbs. per square inch; to a crushing weight the resistance is said to be equal to 746 lbs. per inch; but as the experiments upon which the latter resistance was calculated were obtained by the hydraulic press, little confidence is to be placed in them. ATKINSON'S CEMENT. POZZUOLANO. TARRAS.

The only *artificial* calcareous cement largely used in building is the Portland cement, which is obtained by the calcination of a mixture of clay and chalk representing the carbonate of lime of the natural cement stones. There are no trustworthy accounts of the proportions used, for they seem to constitute the mysteries of trade; but it would appear that the carbonate of lime and clay are usually present in nearly the same proportions as in the Yorkshire stone; as however the clays used by the best makers are obtained from the alluvial deposits of the Thames and the Medway, it is possible there may be in them some ingredients which act a considerable part in the resistance of these cements.

It is in the burning or calcination, however, that the principal cause of the difference between the natural and the artificial calcareous cements is to be found; for, as was before stated, the natural cements are not exposed to any extraordinary heat, whilst the artificial cements undergo even the commencement of a vitrification. One effect produced by this extreme calcination is, that the specific gravity of the Portland cement is much greater than that of the Roman.

It appears that the peculiar properties of this class of materials depend to a great extent on the simultaneous calcination of the clay and chalk; and therefore it is that the Portland cements obtained by subsequently mixing burnt liassic clays with lias lime, do not produce the results which characterize the real Portland cement. This may be explained by the supposition (for as yet nothing is absolutely known upon the subject) that some extraordinary chemical combination between the clay and the lime takes place under the influence of heat in the kiln, which neither takes place in the natural combination effected originally in the humid way in the septaria, or in the artificial combination of the two separately calcined materials. The rate of setting of even the best Portland cements is slower than that of the Roman ones; but the degree of hardness attained within a short period is much greater in the case of the former than in the case of the latter; and moreover it is important to observe, that the hardness of the "set" Portland cement mortar continues to increase for a long time, whilst the hardness of the Roman cements rapidly attains its limits, even if it does not diminish within a, comparatively speaking, short period. The resistance of Portland cement to an effort of rupture by extension, is stated to be 146 lbs. on the square inch; the resistance to compression, ascertained as before by the hydraulic press, is stated to be 2,074 lbs. per square inch. One advantage which Portland possesses over Roman cement, is that many persons consider that the former does not require to be coloured or painted.

It appears that, practically, it is advisable to use the natural or the Roman cements *pure*, in hydraulic works where extreme rapidity of setting is required; but in cases where the rapidity of setting is not so much a matter of importance, but where great powers of resistance are required, the use of the best Portland cement, made by the most conscientious manufacturers, is the most advisable; and that the use of the blue lias Portland cements ought to be avoided in all cases where the works to be



executed with it are exposed to the effects of humidity. VICAT, *Resumé des connaissances positives actuelles sur les mortiers*, etc., 4to., Paris, 1828; HASENFRATZ, *L'art de calciner la Pierre calcaire*, 4to., Paris, 1825; TREUSSART, by TOTTEN, *Essays on Mortars*, etc., 8vo., London, 1842; PASLEY, *Observations on Limes and Cements*, 8vo., London, 1847; KNAPP, *Applied Chemistry*, 3 vols. 8vo., London, 1848; AIKIN on *Limestone*, etc., in *Transactions of the Society of Arts*, 1842, and given in *CIVIL ENGINEER Journal*, i, 411; BURNELL, *Treatise on Limes*, etc., 12mo., London, 1850; ENCYC. METROP., s. v. STUCCO; HIGGINS, *Experiments*, etc., 8vo., London, 1780. G. R. B.

**CALCAREOUS SPAR.** A crystallized carbonate of lime, which is dimorphous, forming both **ARRAGONITE** and **CALCSPAR**; see FOWNES, *Manual*, 8vo., London, 1854, p. 283.

**CALCHE** (Gr. κάλχη), supposed to be the Greek name for the plant called in English the marigold (*Caltha palustris*), has been applied to the volute of the capital in the Ionic order; but the *Report of the Inspectors of the Erechtheion* mentions "the epistulum of the Cecropion with unfinished calchai," which can only apply to the **BEZANTS** still remaining, only boasted to be carved into such patera as those on the doorway of the north portico of that building; WILKINS, *Prolusiones*, 4to., London, 1837, pp. 67-8: but see LIDDELL, *Lex.*, s. v.

**CALCINATION.** The operation of reducing limestone to the state as near as possible of a pure oxide of calcium. By an extension which is hardly logical, this word has been applied to all operations in which minerals are roasted to be reduced to a friable state; and ores of iron are said to be calcined, although it is neither desired to obtain lime from them, nor does the lime act any important part in the operation. CALX. G. R. B.

**CALCIUM.** A metal, of a silver-white colour, which ignites on exposure to the air, as it absorbs oxygen with remarkable rapidity, and in the state of the protoxide of calcium constitutes the substance usually known as quicklime. LIME. G. R. B.

**CALCO** (PAOLO DA) is inserted under the date 1399 in the list of architects to the cathedral at Milan. GUILINI, *Memorie*, 4to., Milan, 1760, xi, 458. 27.

**CALC SINTER.** A stalactitic or a stalagmitic carbonate of lime, also called concretionary limestone, because it forms nearly parallel zones, more or less undulatory, which sometimes have a slightly fibrous texture. ALABASTER. TRAVERTINO. W. H.

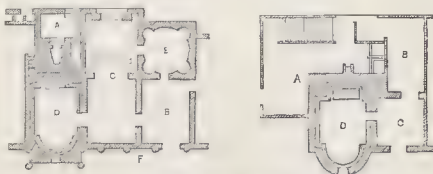
**CALC SPAR.** Crystallized carbonate of lime, found native and pure, also called calcareous spar; it does not alter under a moderate heat, while **ARRAGONITE** falls into a powder.

**CALCUTTA.** The capital of the presidency of Bengal. The city, which is almost four-and-a-half miles long and one-and-a-half mile wide, and enclosed by "the circular road", has its northern portion occupied by narrow streets, with shops, the stories over which are dwellings for the natives: the southern part consists of wide streets, with houses, generally detached, built of brick and stuccoed with **CHUNAM**; such is Chowringhee, the fashionable quarter, which looks on to the river Hooghly, the Fort William and its church, the esplanade and the race-ground: the new theatre (in a classic style); the post-office, the Asiatic Society's house, and the Hindostani college, are the leading buildings in that quarter; outside it are the gaol and the general hospital, and three miles further south is the Bishop's college (Gothic). The city generally is supplied with water from an open tank covering twenty-five acres and 60 ft. deep, and occupying the centre of the principal square; it is nearly always at the same level, and fresh, in consequence of the numerous springs which it contains. The site of the cathedral dedicated to S. Paul occupies about seven acres; the first stone was laid 8 October 1839; the cost was about £40,000 for the building and £7,000 for the organ, windows, bells, clock and fittings. An alabaster model, 5 ft. long by 2 ft. high, executed in Italy, of the building, was presented to the Bodleian library at Oxford. The design was by Lieutenant-Colonel Forbes of the Bengal Engineers, who has acted as architect to all the principal buildings, including the mint, at Calcutta since about

the year 1823; it is in a Perpendicular or Third Pointed style, with several modifications. The structure, holding eight hundred persons, is 248 ft. long by 83 ft. wide, and 114 ft. in the transepts; 59 ft. high to the top of battlements, or 47 ft. high inside under the flat-curved and iron-trussed roof; the spire, 99 ft. high, rises 204 ft. from the ground: the place of the nave is occupied by a verandah projecting 61 ft., with a library over it 35 ft. high; it is of brick covered inside and outside with chunam, and has Chunar-stone dressings. Further details are given in the *BUILDER Journal*, vi, 149, and a view in the *ILLUSTRATED LONDON NEWS Journal*, vii, 252; the same work, xiv, 212, gives a view of the Chinese burial ground; and xiv, 35, a description of the Medical College hospital, 1848, by Messrs. Burn. The government house, a centre with four wings X, built 1798-1805, the town-hall, the custom-house, the law courts, the treasury, the Metcalfe hall, all occupy, with the cathedral, the centre of the town near the river. DANIELL, *Oriental Scenery*, 2nd series, fol., London, 1797, illustrates a temple on the Chitpore-road, the council house, the writer's buildings, Govinda Ram Mittee's pagoda, and modern villas in Chowringhee. The old cathedral, 1784; four churches, besides that in the fort; eleven chapels of various persuasions, of which the Scotch, the Greek, and the Armenian, are the most architectural; two native colleges; a Chinese temple; and several mosques and Hindoo temples, complete the list of the chief buildings. A map of the city is given by the Society for the Diffusion of Useful Knowledge, No. 170.

**CALDARA DI CARAVAGGIO** (POLIDORO), a painter of imitations of *rilievi*, constructed between the years 1527-43 several buildings at Messina. He was murdered in 1543. 73.

**CALDARIUM.** The vapour and hot bath of the ancient *balneæ* and *thermæ*. VITRUVIUS, v, 11, directs that the length of the vaulted sweating-room (*sudatio* or *sudatorium*) should be twice its breadth, and have at one end the **LACONICUM**, at the other the hot bath. He never mentions the *laconicum* as separate from the hot bath, *caldarium*; it may therefore be presumed to have been always connected with it in his time, although it is held to have been a separate apartment, '*laconicum sudationesque*', in the *thermæ* constructed by the later emperors: in the *thermæ* at Pompeii they are united, and exactly agree with the text of VITRUVIUS, the *laconicum* or vapour bath having a *labrum* in it in addition to the *ALVEUS* or hot bath at the other end of the room; the vapour bath, when distinct from the hot bath, was called the *sudatio concamerata*: it was constructed



Detached Essay

with floors and walls made hollow for the conveyance of heated air, as D, D. *Detached Essay*, BATHS AND WASHHOUSES.

**CALDERARI** (IL CONTE OTTONE), member of most of the Italian academies, and one of the foreign members of the Institute at Paris, was born about 1730 at Vicenza, where he designed, built, and altered many edifices, the chief of which were published after his death in the collection called *Disegni e Scritti*, fol., Vicenza, 1808-15. Among his executed works are the church near the casa Monza at Braganze, 1760, ii, 1, 2; the casino in the Pallamajo for signor Sebastian Anti Sola, 1772, i, 10-15, 46, 47; the palazzo Bonini in the Strada di Porta Nuova, 1773, i, 27-30; the palazzo Cordellina (not Cordinella, as in MILIZIA), his largest work, in the Strada Reale, 1775, i, 19-24; these are in Vicenza: the palazzo Porto at Vivaro, 1778, and its chapel, 1775, i, 31-36; the seminario arcivescovile at Verona, 1783 (his best work, NAGLER, ii, 24-26; the church



of S. Orso, 1777, i, 16-18, not completed but published separately by him in 1777 (MILIZIA); and in Vicenza the palazzo Loschi in the Corso, 1782, i, 5-9; a casino for signor Aurelio Todaro, 1785, i, 25-26; and the fabbrica Capra on the Corso, ii, 3-8, which was about his last work. His portrait is given in GAMBA, *Galleria de Litterati*, Venice, 1824. He died 26 October 1803. ANTI-SOLA, *Tributo*, 8vo., Vicenza, 1804; LE BRETON, *Notizie Storiche*, 8vo., Padua, 1839. 108.

CALEFACTORY. The name of an apartment in a monastery, and explained as the "common-room with a fire" at the abbey of SS. Peter and Paul in Shrewsbury, by BLAKEWAY and OWEN, *History of Shrewsbury*, 4to., London, 1825, ii, 48.

CALENDAR. A register of the succession of the months, etc., in the year, which has given subjects of ornamentation, such as that at the cathedral in Paris, FAURIS DE S. VINCENT, in the *Magasin Encyclopédique* for September and October 1815: that on the portal of the church of S. Denis, LENOIR, *Atlas des Arts*, pl. 20: that at the cathedral at Chartres, LASSUS, *Monographie*: that on a column in the church at Souvigny, *Bulletin du Comité Historique des Arts et Monuments*, ii, 692-94: that at the cathedral in Senlis, which resembles one from a manuscript given in CAHIER, *Bibliothèques*, 8vo., Paris, 1842: that on the tympanum of the doorway of the church of S. Ursin at Bourges, JOUFFROY, *Siècles de la Monarchie Française*, fol., Paris, 1823, pl. 38: that of the mosaic pavement from one of the chapels of the church of S. Denis, illustrated by LENOIR, *Atlas*, pl. 21, and relaid under M. Debrét: and that on one of the archivolt of the great central entrance to S. Mark's at Venice, described by RUSKIN, *Stones*, 8vo., London, 1853, ii, 271, who mentions those of the cathedral at Lucca, and of the baptistry at Pisa, gives, 276, lists of symbols, and describes, 362, a capital decorated with them from the ducal palace. ZODIAC. 7.

CALENDARIO (FILIPPO) erected the whole of the loggia of the palazzo ducale at Venice towards the sea, and the following first twelve (eight?) columns of the *broglia* or return of that building which forms part of the east side of the piazzetta di S. Marco, and died in 1354, whereupon Bartolomeo finished the remainder 1423-9, according to the *Handbook for Northern Italy*; but CICONARA, *Storia*, fol., Venice, 1818, i, 321, 425, quoting a manuscript chronicle, and EGNATIUS, *De Exemplis*, 1544, pp. 275, 278, show that Calendario, who was hung 1355 for participation in the conspiracy of the doge Marino Faliero to whom he was allied, was the architect not only of these works, but of the sala del Consiglio, finished 1365, and not a mariner as suggested in the *Handbook*; while RUSKIN, *Stones*, 8vo., London, 1853, i, 29, ii, 296, iii, 199, admitting that the Calendario who was hung was certainly one of the leading architects of his time, and had for several years the superintendence of the work of the palace, observes that it appears from the documents collected by CADORIN, *Pareri*, 8vo., Venice, 1838, p. 122, 181, that the first designer of the palace, the man to whom we owe the adaptation of the Frari tracies to civil architecture, was Pietro Baseggio, who is spoken of expressly as "formerly the chief master of our new palace" in the decree of 1361, and who, at his death, left Calendario his executor. Other documents collected by ZANOTTO, *Venezia e la sue Lagune*, show that Calendario was for a long time at sea, under the commands of the Signory, returning to Venice only three or four years before his death; and that therefore the entire management of the works of the palace, in the most important period, must have been entrusted to Baseggio. BREGNI. BRIOSCO. RICCIO.

CALETO or CALCATO (JOHN), abbot of Peterborough from 1248 to 1261, built the infirmary of the monastery, and a chapel at the west end of the abbey church. BRITTON, *History, etc. of Peterborough*, fol., London, 1828, p. 56.

CALF-HOUSE. A place in which calves are confined for the purpose of fattening. It was formerly annexed to the cow-house, but the best position is one quite removed from it. Eight feet in width are required for a single row of pens; 4 ft. being

occupied by the stage or floor, 1 ft. by the trough placed in its front, and 3 ft. by a gangway. The floor, when paved with bricks, requires constant washing, it is therefore often made of laths or battens about 2 ins. square, laid *along* the stage with intervals of 1 in. between them on joists upon piers, so as to keep the floor from 1 to 3 ft. above the ground, and to allow fresh air passing underneath the bedding; where there is not much depth below the floor, it is well to form the flooring in trap-doors made of latticework flush on the upper surface. The outer enclosure is 3 ft. high, generally consisting of staves  $1\frac{1}{2}$  ins. in diameter, let at the bottom into a cill on the floor, and steadied at the top by a capping which, as well as the bottom piece, is entered into the end wall. Every alternate hole in the upper rail is so large that the stave can be lifted out to give entrance to the animals; one of which is usually fastened to every second staff, when the staves are 9 ins. apart. The house is rarely separated by partitions; but they prevent many accidents, and could be made moveable at pleasure. CATTLE-SHED. 2.

CALIBRE. The diameter of the interior of a tube; and also of the object which would fill the tube: it is also used in the French language for a mold with which to run a string-course or other molding.

CALIBRE, CALIBER, or CALLIPER, COMPASSES. Compasses with crooked legs to take the diameter of convex or concave bodies. 2.

CALIDUCTS. The name given to the flues used by the Romans and some modern nations for the conveyance of heated air from one common furnace to several parts of a building. 2.

CALKING, or CAULKING. The operation of forcing hemp or spunyarn into the joints of planking for the purpose of making them water tight; it is effected by driving the yarn by means of mallet and chisel, and the upper portions are then paid with hot pitch. When this is proposed as a bottom for the brick or tile pavement of a hot-house, there is the objection that the high temperature will bring out the scent of the pitch. CALQUING. G. R. B.

CALLADO, see CARIADO STONE.

CALLAISCHROS, with Antimachides, Antistates, and Porinos, laid the foundations of the temple to Zeus Olympios at Athens under Peisistratos (560-527 B.C.); VITRUVIUS, vii, preface.

CALLET (FELIX?), born at Paris 10 March 1755, was the author of the *Notice Historique sur la Vie Artistique et les Ouvrages de quelques Architectes Français du Seizième Siècle*, 8vo., Paris (2nd edit.), 1843, and was living in 1842.

CALLET (FELIX), his son, born at Paris 1791, was a pupil of Delesspine, gained the second *grand prix* 1818, and was sent to Italy in consequence of obtaining the first *grand prix* 1819; there he designed the restoration of the Forum at Pompeii. He was one of the authors of the *Architettura Italiana ou Recueil explicatif des Palais, Maisons*, etc., 1827; and built his own house, rue du Mont-Parnasse at Paris, where he also designed the following works, given by NORMAND, *Paris Moderne*, 4to., Paris, 1837, viz.: 1832, the salle des Commissaires-Priseurs, No. 1 Place de la Bourse, ii, 108-10; 1836, the house No. 11 rue Neuve S. Georges, ii, 35-37; and 1845, the château de Saulseuse, iii, 93-96. He died after 1854.

CALLI or CALLO (Mexican for a house) is the name given to some remains, said to be those of a palace of the Incas of Peru, situated about one day's journey southward of Quito in South America, and illustrated by HUMBOLDT, *Atlas Pittoresque*, fol., Paris, 1810, pl. 24, p. 195, who describes them as a court about 95 ft. long and 60 ft. wide, with a central entrance at each end, and an apartment in each angle, so as to leave a central entrance to each side of the court. There are only three of the apartments remaining, which are entered by a doorway in the centre of the court front; and each room has eighteen stone saddle pins or cloak pins. The walls are about 15 ft. high, in eleven regular and equal courses of squared stone ashlar of



various lengths, with a concrete hearting: the masonry resembles classic work in being rusticated with smooth faces, as shown in the margin. The doors diminish in aperture from the sill to the lintel, which is not rusticated: the jambs cut through the rustication, as if they had been worked afterwards; this is also the case with a range of niches or cupboards of the same character as the doors, but having chamfered edges at the top and sides.



CALLICRATES, in connexion with Ictinus, built the temple of Minerva called the Parthenon, at Athens, and also undertook to erect the long wall termed Σκῆλη. He flourished about 460 or 440 B.C. PLUTARCH, in v. *Pericles*, 13.

CALLIMACHOS of Athens is stated by VITRUVIUS, iv, 1, to have invented the Corinthian capital, and therefore is supposed to have lived before B.C. 396, about which time Scopas built a temple of that order to Minerva at Tegea in Arcadia, PAUSANIAS, viii, 45: and as remarked by D'HANCARVILLE, *Antiquités*, fol. Paris, 1766, iv, 199, must have been a different person from the sculptor of the statue of Zeus, who was alive in B.C. 260, and probably from the inventor of drilling marble mentioned by PLINY, *Hist. Nat.*, xxxiv, 8, and PAUSANIAS, i, 26, who confound them. 59.

CALLITRIS QUADRIVALVIS. The name now given to a plant of the north coast of Africa, formerly called *THUJA articulata*. It is the *alerce* of the Moors, and was employed in the woodwork of the mosque, now the cathedral, of Cordova; see GRAULT DE PRANGEY, *Essai*, 8vo., Paris, 1841, p. 35. C. Ecklonii, cedar (*sapru hout*), Cape of Good Hope, is light, short, and resinous, from 1 to 4 ft. in diameter, and 10 to 25 ft. long, used for roofing planks, etc.

C. australis, Oyster bay pine, is found only on the east coast of Van Diemen's Land, and is used for internal fittings of houses and for agricultural implements. 71.

CALLOW. The earth producing grass and covering a bed of virgin soil: the operation of removing which to get at brick earth, gravel, rock, etc., is called *uncallowing*, and includes the grass, etc., unless the turfs are removed.

CALMAY, see CASTROHUOIN.

CALODENDRON CAPENSE, wild Chestnut (*wilde kastanje*). A soft and light wood of the Cape of Good Hope, used for beams and planks. It is obtained from 3 to 4 ft. in diameter, and from 15 to 30 ft. long. 71.

CALOPHYLLUM INOPHYLLUM, and C. ANGUSTIFOLIUM, *Poon* or *Peon wood* of Singapore and Penang. It is a large tree; the wood is of a light porous texture, and of a light greyish cedar colour; it is used for planks in ship-building, and yields very straight spars employed for masts. The Calcutta Poon is preferred. In the woods of Martaban it is called *thurappe*. 71.

CALOTTE. A French term given to a segmental dome, lathed and plastered, formed to diminish the height of a chapel, cabinet, etc., which else might be too high for the other rooms of the suite. 4.

CALP. A limestone so called from a name accidentally given to the very extensive beds of impure limestone and shale which prevail in the counties of Dublin, Meath, Longford, Donegal, Sligo, etc., in Ireland. It differs from the ordinary carboniferous limestone, in its being generally of a dark blue colour (though sometimes of a pale ashy appearance), and in its alternating with beds of clay or shale; and it commonly contains a large proportion of silex, which renders it hard, brittle in fracture, and frequently very difficult to work. It produces large, flat-bedded stones, which, however, are seldom of much thickness. Its quality is exceedingly variable even in the same quarry; and some quarries contain stone which when burnt produces good lime, while others have few or no beds fit for that purpose. In Dublin it is chiefly used for rubble walling; some of the public buildings having been erected without due

ARCH. PUB. SOC.

care in the selection of the good beds, the stone on exposure becomes like so much laminated clay in a perishable state. It has been used in the basement of the library, Trinity college; the custom house docks, from Leixlip quarry; the chapel, and the Birmingham tower at the castle; S. Patrick's cathedral, chiefly; Christchurch cathedral; the church in Mountjoy-street, etc. WILKINSON, *Geology, etc., of Ireland*, 8vo., London, 1845, p. 37, 241, etc.

CALQUING or CALKING, probably from the French word *calquer*, to trace. The art of transferring an outline on to another surface by means of pressing with a blunt point the lead or chalk with which the back of the original is covered. It is sometimes called 'tracing'. STENCIL TRANSFER. 4.

CALTAGIRONE or CALATAGIRONE. A city in the province of Catania in Sicily. The streets are spacious and clean, as the municipal regulations are remarkable. The cathedral dedicated to S. Julian, the collegiate church of S. Giacomo, with three other churches, sixteen monastic edifices, the palazzo municipale, the educational establishments, and several private edifices, are worthy of notice. 50. 96.

CALVADOS; BUILDING STONES OF. In addition to the oolitic limestone extracted from the quarries near Caen (CAEN STONE), the department of Calvados furnishes several descriptions of building stones, which might advantageously be used in England on account of their quality, and the low price at which they could be shipped as back freight. These are principally obtained from the great oolite formation. The first in order, the Ranville stone, is worked in the commune of the same name, on the right bank of the Orne, in one of the upper members of the series, which continues across the river through Fontaine Henri to Creully on the extreme north-west frontier of the formation. This division of the oolite corresponds geologically with the cornbrash of England; but it differs lithologically, and in consequence of the peculiar nature of its fossils, the French geologists have called it the *calcaire à polypiers*. It is usually of a highly fissile character, especially in the upper beds; so much so as only to be adapted for random rubble work. At Ranville, Fontaine Henri, Courseulles, and Creully, however, the beds become sufficiently solid to allow of their being worked for the purpose of extracting ashlar. When the stone of this *upper oolite* is thus able to be worked, it is harder, less hygrometric, and is capable of supporting a greater crushing weight than the stones of the *great oolite*; but it is of a coarser grain, and of a more disagreeable colour. It is principally used by the French engineers for hydraulic works, for which purposes, when of a homogeneous character, it answers remarkably well. Much attention is, however, required in its selection, for the Ranville stone contains many argillaceous and arenaceous beds, which are highly susceptible of decay. Large quantities have been used at Havre, Dieppe, Eu, Treport, etc., for the execution of the quays, locks, sluices, etc., in sea water; at Caen the plinths and basements are usually executed of it; at Bayeux the stone obtained from this formation at Creully is much used; as also the steeples of S. Pierre, and of some other churches in Caen; the cathedral of Bayeux was principally built of the Fontaine Henri stone; and the small port of Courseulles is executed with stone raised in the immediate neighbourhood.

The Ranville quarries may be taken to represent the type of the upper oolite of the Calvados. They are situated on the left bank of the Orne, and are worked on an open hill side, being separated from the river by a towing path only. The beds incline to the north-east rather rapidly; the currents or cross fissures run north by west to south by east; and the ordinary description of the beds is as follows:—After removing about 2 ft. in thickness of vegetable soil, a series of highly fissured beds of useless stone 6 ft. thick is met with. The *premier banc de chien* then occurs, which furnishes a hard coarse-grained stone; it is 2 ft. 4 ins. thick, and is succeeded by the *deuxième banc de chien*, also 2 ft. 4 ins. thick. Below this lies the *banc*



*de libage*, 6 ft. thick, yielding a hard, coarse-grained, but very irregular stone, and passing into a bed about 2 ft. thick, which is in some quarries argillaceous, in others exclusively calcareous, and abounds in fossils. Then occur a series of beds, 16 ft. thick, of the most extraordinary variety of composition even in the same quarry, passing at last into *la pierre franche*, or the good working beds, from 26 to 33 ft. thick. Sometimes the upper beds are so highly fissured as only to be fitted for random masonry; at others the whole depth of the formation is so solid as only to be worked by what the quarrymen call *à lit force*. Stones 20 ft. in thickness can be obtained, but the cross vents and shakes prevent the attainment of large dimensions in other directions. The usual size of the blocks is from 4 ft. 6 ins. to 5 ft. long, 3 ft. wide, and 2 ft. high; the stone weighs in the proportion of about 16 cubic feet to the ton, its specific gravity is about 2.07, and it bears a crushing weight of 1387 lbs. on the square inch.

The great oolite retains the characters described in the notice of the CAEN STONE, until it reaches the southern border of the department near Falaise. Quarries are opened in it for local consumption, as at Ifs, Rocquecourt, Cauvicourt, etc.; but the expensive land carriage effectually excludes these stones from the English market. Near Falaise, however, the oolitic structure becomes nearly obliterated, and the texture of the stone passes into that of a sublamellar calcareous spath. The beds are usually separated by layers of flints, and numerous detached nodules are to be found dispersed in the body of the stone. The most important quarries are situated in the commune d'Aubigny, and they are worked partly open to the sky, and partly in gallery. The beds dip towards the east and south, with currents or longitudinal fissures in the same direction, and vents at right angles to the currents. Many attempts have been made to introduce this stone to the English market, notwithstanding a land carriage of seventeen miles; but the fearful state of decay of all the buildings in Falaise executed in it ought to cause much hesitation in its use. The following is a description of the ordinary nature of the beds traversed:—Under a layer of vegetable soil 1 ft. 3 ins. thick, is a series of highly fissured beds 4 ft. thick, a second series of unworkable beds 18 ft. thick, and then the *banc de reble* 1 ft. 4 ins. thick. It is used locally for rubble work, and was formerly employed in the construction of the churches at Falaise; it is irregular in its texture, and in its powers of resistance to atmospheric influences. Below this is the *banc tendre*, 1 ft. 8 ins. thick; it was formerly worked, but the stone from it has always decayed. It is succeeded by the first layer of good stone, called *le banc de marche*, from 2 ft. 2 ins. to 2 ft. 4 ins. in thickness, and lifted occasionally in blocks from 5 to 16 ft. long, 4 ft. wide, and 1 ft. 2 ins. or 2 ft. 4 ins. thick. Below this is a bed of marly limestone used locally for rubble masonry; and then a second bed of good stone, from 1 ft. 4 ins. to 1 ft. 6 ins. thick. The last bed and the *banc de marche* are the only ones now used, but they disintegrate by frost, if exposed before losing their quarry damp.

At Bretteville-sur-Laise, in the commune of Quilly, some of the members of the inferior oolite are worked, but they are little known beyond the immediate neighbourhood, although occasionally sought for by sculptors and others who require fine, easily worked, and durable stones. The figures in the courtyard of the bourse at Caen, attributed to Jean Goujon, are executed in this material, and the church of Quilly itself, of the eleventh century, may also be referred to as a proof of its durability in the country: indeed, of the finer oolites of the Calvados, the Quilly stone must be considered to be the best adapted for ordinary building or for statuary purposes. The beds may be described as follows:—About 2 ft. of vegetable soil and 8 ft. of quarry cap has to be removed before reaching *le banc de palier*, 1 ft. thick, used in the country for landings. Below this is the *banc d'alabatre*, 3 ft. 8 ins. thick, sometimes divided into two layers, and affording the best stone. Then follow *le banc de marche*, 8 ins. thick; *le banc de rongalier*, 2 ft.

3 ins. thick; then two beds, which in some cases are hardly distinguishable from one another, and are often raised together, their united thickness is about 3 ft., and the stone they yield is sound, fine-grained, and very uniform in texture. Next to these is the *banc de crasallier*, which is too sandy to be of use; it is 1 ft. 4 ins. thick; then *le gros dur*, 1 ft. 8 ins. thick, of irregular texture; and then *le banc franc*, 2 ft. 6 ins. thick, of good stone, but not equal in quality to that of *les bancs d'alabatre*, or the two beds under the *banc de rongalier*. In most quarries this is the last bed worked, but in others the quarrymen raise *le banc de robin*, 1 ft. 4 ins. thick; *le banc joli*, 1 ft. 8 ins. thick, much used in the country for making apple presses; and *le banc soumet*, 1 ft. 3 ins. thick, and *le banc de diable*, 1 ft. 6 ins. thick, which two last are so hard as to be unfit for ordinary building purposes. The blocks furnished by the best beds are usually from 5 to 7 ft. long, 3 ft. 4 ins. wide, and 3 ft. high: the specific gravity and the powers of resistance of this stone are rather greater than those of the ordinary Caen stone.

There are some quarries of considerable importance worked in the liassic formations at Fontenay, on the west of Caen, for the purposes of burning the stones for hydraulic lime, and for the supply of steps, flag paving, and rubble masonry, in the neighbourhood. The lias in this district varies in its character as much as it does in our own country, and the beds which in one part of a quarry present the characteristics of a calcareous marl, yielding energetically hydraulic lime, within a very short distance pass into a friable stone, containing so many ferruginous oolites and so much silex as to be totally unfit for burning. The flag paving and landings of this deposit are only fitted for local use.

The transition limestones furnish some marbles of an analogous description to those which occur near Plymouth. They are compact, imperfectly crystalline, and slightly translucent on the edges: their colours are either grey with a bluish tinge, grey passing into yellow, a dull black, or reddish with yellow and rose coloured veins. From some ruins discovered near Caen, it would appear that the Romans worked these marbles; and cardinal Richelieu selected the marble from the quarries at Vieux for the high altar of the Sorbonne at Paris. At the present day the cost of land carriage on these materials would effectually prevent any resort to the quarries of Fresnay le Puceaux, Bretteville, Bully, Vieux, and Clécy (which are the best in the department), for the supply of marble to England.

The old red sandstone of the neighbourhood of May, on the south of Caen, is used largely for the purposes of road paving and the supply of stone for macadamized roads, and with great success. This material is not, however, of sufficiently good quality to merit its introduction in cases where granite could be obtained at even considerably greater cost. MUSGRAVE, *A Ramble, etc., through Calvados*, 8vo., London, 1855. G. R. B.

CALVARY. A sculptural representation of the passion of the Saviour, placed upon a natural or on an artificial rock, or upon an architectural pedestal or basement. Few Spanish cities are without *las Estancias*, the fourteen stations, which lead to the *calvario*. Perhaps the most important as a detached work in Europe is that commenced 1486, and called *il Sacro Monte*, at Varallo in the val Sesia in Piedmont, which has forty-six chapels or oratories, rich in façades and domes, etc., each containing figures modeled in terra cotta, painted and clothed to imitate life, and sometimes sixty or more in number, grouped to represent, in conjunction with pictured walls, some of the principal events in the history of the Saviour; the subjects are given in the *Handbook for Switzerland*, p. 267. One of the next in importance is that in the churchyard of the Dominican monastery of S. Paul at Antwerp, a huge mass of rock and grotto work, with a crucifixion at the top, a sepulchre at the bottom, numerous statues of saints in varied attitudes, and a sort of Scala Santa. Numerous Calvaries and *vivæ crucis* are placed on prominent rocks along the valley of the Sun in the Tyrol, and



they are frequent in Piedmont. Over the altar of S. Eustorgio at Milan is a reredos of white marble with bassi rilievi and statues, from which rises a vast Calvary; S. Sepolcro at Bologna, is quite filled by a huge Calvary; and Zusmarshausen near Augsburg has a dead-house with a Calvary at the east end, and S. Peter in his penitence below it: WEBB, *Sketches*, 8vo., London, 1848. The Calvary at Plougastel near Brest, an arcaded basement of the Doric order, with a sculptured frieze as a sort of attic to it, on which is a crowd of statues surrounding the Crucifixion (2 plates); that at Guimiliau; that at S. Thégonec, one of the best of its sort (2 plates); that at Clédén, one of the simplest, and little more than a crucifixion; and that at la Forêt near Quimper, are given in NODIER and TAYLOR, *Voyages Pittoresques* (Bretagne), fol., Paris, 1845, ii.

**CALVERLEY STONE.** A sandstone quarried on the Calverley estate, near Tonbridge Wells in Kent. It is of warm variegated brown tints, obtained of all sizes from three beds, respectively 9-14, 36-42, and 24 ins. thick. An analysis of 100 grains is said to have shown 94.0 quartz, 2.5 peroxide of iron, 2.0 carbonate of magnesia, and 1.5 alumina. The quarries, said to have supplied the materials for Bayham abbey, still standing in their vicinity, were reopened in 1827, and the stone from them has been used at and near Tonbridge Wells in two churches, the Roman Catholic chapel, the Victoria school, the town hall, the new market house, the infirmary, two hotels, and more than a hundred houses. Sixteen cubic feet are calculated as one ton. *Report of Commissioners on Building Stones*, etc., fol., London, 1842.

**CALVI** (the Roman CALES). A small city in the province of Terra di Lavoro in the kingdom of Naples. The ground for miles round is covered with ruins, including some recently discovered painted chambers, and a ruin called Sta. Casta, said to have been a temple, but more probably a bath; a brick arch, a theatre, and a still perfect fountain. The town, besides a small ruined mediæval castle, contains a cathedral dedicated to S. Casto, the episcopal palace, and the *seminario*, all built 1740-70 by Carlo Zoccioli. CRAVEN, *Excursions*, 8vo., London, 1838. 3.

**CALX.** A name given to the oxides of metals after they have been calcined; it being formerly an opinion that the powder which remained after calcination was a metallic lime. BRANDE, *Manual of Chemistry*, 8vo., London, 1836; HOFFER, *Dictionnaire de Chimie*, 12mo., Paris, 1848; FIGUIER, *L'Alchimie et les Alchimistes*, 8vo., Paris, 1855.

G. R. B.

**CALYON** (Fr. *caillou*?). An old generic name for boulders or flints used for building, according to the *Promptorium Parvulorum*, and the *Building Accounts* cited s. v. in PARKER, *Glossary*.

**CALYPTRANTHES.** The sort called *jam* of this wood is used for common planks; another, called *sajam*, is close, tough, and hard; both are natives of Gualpara in the East Indies. 71. CALZADA, see DOMINGO DE LA CALZADA (SANTO).

**CALZOLARI** (ORAZIO) and Andrea Massimbeni designed about the year 1283 the church and tower of S. Domenico, and the church of S. Francesco now the Ospedale Maggiore, both at Cremona. 57.

**CAMAIEU** or **CAMEO**. This term was applied in France and England during the eighteenth century to a painting in a single colour (brooch) to imitate a basso-relievo on a gold, a blue, or other coloured ground. The French distinguished a monochrome coloured with grey tints as *grisaille*, and with yellow tints as *cirage*. SCRAFFITO. 4. 25.

**CAMARA** or **TONKIN-BEAN**, see DIPTERYX.

**CAMAROSIS** (Gr. *καμάρωσις*). This term is translated by GWILT "an elevation terminated with an arched or vaulted head"; by NEVE, "rising with an arch"; by LIDDELL, "an arching"; and by DONNEGAN, "the act of arching".

**CAMBA.** The late Latin term for a place wherein brewing and sometimes baking were done. BUTTERY. 80.

**CAMBAY** or **CAMBAYET.** A seaport in the province of Gujerat in Hindostan, surrounded by a brick wall about three

ARCH. PUB. SOC.

miles in circumference, with fifty-two bastions. At about three miles distance the ruins of two Hindu temples mark the site of the ancient city of the same name. Formerly every street in the modern town was fortified and had gates, a few of which still remain. The *darbar* or palace; the adjoining mosque 210 ft. square, called Jumma Mosseid, formerly a Jain temple of the eleventh century; a Jain temple dedicated to Parswanatha, whose statue is dated 1602, *with a crypt*, are the chief buildings; in the suburbs are some large Hindu mausoleums and Mahometan tombs. TODD, *Travels in Western India*, 4to., London, 1839, p. 248; FORBES, *Oriental Memoirs*, 4to., London, 1813, ii, 16, iii, 51-161.

**CAMBER** (Fr. *cambre*). A curvature upwards is called a camber when on the lower boundary of a horizontal beam, but a HOG-BACK when the upper outline is so treated. TREDGOLD, *Elementary Principles of Carpentry*, 4to., London, 1828, p. 96, observes that "it is the common practice in framing roofs to force the tie-beam to a certain degree of camber, which appears to have been introduced under the idea that a cambered beam partakes of the nature of an arch; this, as has been justly observed by a late writer (ENCYC. BRIT., s. v. *Carpentry*, *Supp.*, p. 646), is one of the fallacies which it is the business of the mathematical theory of carpentry to dispel. It is obvious that when a cambered beam settles, it has a tendency to thrust out the walls instead of being a bond to tie them together. The Gothic builders sometimes laid naturally crooked timbers with the round side upwards for tie-beams; but then their walls were capable of supporting a considerable lateral pressure. In some of the tie-beams of Durham cathedral this curvature is very considerable; but modern walls are constructed on different principles, and require all the connexion a roof can be made to give them, instead of being sufficient to withstand the thrust of a cambered beam. Where there are ceiling-joists it is easy to keep them a little higher in the middle of a ceiling, at the rate of about an inch in twenty feet, which prevents the settling from offending the eye of the beholder; and consequently accomplishes all that Mr. Price and others propose to do by cambering the beam."

In fact the camber given to a tie-beam is not merely to satisfy the eye; it is intended to provide for the slight depression that any framed truss must experience on first coming to its bearings, so that when it has reached its ultimate settled state, the tie-beam may not be convex.

**CAMBER ARCH.** A very flat segment of a circle. The apertures of doors, windows, and other openings, are now most frequently covered with so-called *straight arches*, but if the soffits of these be not executed with a camber, they seem to bend or *sag*, and would probably sink from the shrinkage and settlement of the work. A straight arch, so constructed, is usually termed a camber arch, or more properly a cambered arch, and the amount of camber is regulated by a CAMBER PIECE.

**CAMBER BEAM.** A beam whose under side is naturally or artificially cambered. The name is improperly given to a piece of timber cut with a curve or hog-back, or an obtuse angle so as to form a declivity on each side from the centre of its length on its upper side or back.

**CAMBER SLIP**, or rather **CAMBER PIECE.** A piece of wood fixed in setting the bricks of flat arches, so that its upper curved surface corresponds with the intended soffit of the arch; the bricks forming the arch having been laid, set, and carefully jointed, the slip is allowed to remain until the work is dry.

**CAMBER SLIP**, is properly an instrument used by bricklayers and masons, made of a piece of good deal or mahogany, about four inches wide, half an inch thick, and from six to eight feet in length, with one edge made to the curve of a segment of a circle, say for a camber of one inch in the length, and the other edge either straight or for a camber of half an inch. The intrados of *straight* brick arches is described upon the greater curve, and the extrados, which is sometimes straight, should be drawn by the smaller one.



**CAMBIAGO** (RINALDO) designed in 1619 the Augustinian monastery of Sta. Maria della Misericordia at Castellone, near Cremona: the church of S. Bartolomeo in Cremona (now the custom house) contained the following inscription: "Rinaldus Cambiagus architectus omnium artium architecton jam mortem meditans s. p. 1640. 57.

**CAMBICHES** or **CAMBIGES**, see **CHAMBIGES** (MARTIN).

**CAMBIO** (ARNOLFO DI), commonly called Arnolfo di Lapo, is supposed to have been born in 1232 and to have been the pupil of Cimabue (VASARI), and the master of Fra Ristoro da Campi and Fra Sisto (BALDINUCCI); LANZI, *Storia*, 8vo., Florence, 1834, i, 21-23, seems inclined to call these last the preceptors of Arnolfo: but all these artists were so nearly of an age as to render the preceding statements improbable: it is also shown in a note to Bohn's edition of VASARI, *Lives*, 8vo., London, 1850, i, 54, "that Arnolfo was neither a son of Lapo, who was but his fellow disciple, nor yet of the German architect Jacopo (who appears to have been a different person from Lapo the sculptor), has long been known from various authorities. The father of Arnolfo was called Cambio, and was of Colle in the val d'Elsa. See BALDINUCCI, *Notizie*, 8vo., Florence, 1845, i, 83, 84; DEL MIGLIORE, *Firenze*, 4to., Florence, 1684, p. 9; CICOGNARA, *Storia*, fol., Venice, 1818, iii, 240; RUMOHR, *Italienische Forschungen*, 8vo., Berlin, 1827, ii, 155; GAYE, *Carteggio*, 8vo., Florence, 1839; and RICHA, *Delle Chiese di Firenze*, vi, 17." That Arnolfo was a pupil of Niccolò Pisano is placed beyond doubt by LANZI, i, 22, and RUMOHR, ii, 148-58. The GUIDEBOOK (1830) to Florence attributes to him the restoration of the ponte alla Carraja in 1318, which was done by BRACHETTI, but he probably restored the ponte di Trinità, which had been destroyed by the flood of October 1269, not 1264 as in VASARI, who gives the following list of his works; viz. in 1284 the outer circle of the city walls, completed about 1327 (VILLANI, *Chronicle*, fol., Venice, 1537); and the loggia, now the basement, as altered by Taddeo Gaddi 1337-50, of the Or S. Michele: in 1285 the loggia and piazza dei Priori (the palazzo dei Priori was commenced in 1252 by Jacopo il Tedesco, and was continued if not completed by Fra Ristoro da Campi and Fra Sisto; FINESCHI, *Memorie*, suggests that it was the palace of the *podestà*, now called del Bargello; and VILLANI, viii, 26, shows that the *priori* had no fixed place of meeting before 1298): the rebuilding of the principal chapel of the Badia, with one on each side of it, enlarging the church and choir (demolished in 1625, and rebuilt); and the campanile (finished 1330) of that church: in 1294 the Franciscan church of Sta. Croce: at a later period the first cloisters to the old convent of the Black or Observantine Friars of that church: the removal of the tombs and arches which made the external facing of the church or baptistery of S. Giovanni, and the renewal of the facing with black marble from Prato (but 1288-93 according to others, see RUMOHR and the *Antologia di Firenze*, v, 1): in 1295 some buildings in the upper val d'Arno, above the fortress of S. Giovanni and Castel Franco: the design, model, and foundations of the church of Sta. Maria del Fiore, the first stone being laid in 1298 (VILLANI, viii, 7), and the erection of the apse with the three principal arches next to it under the cupola: as well as in 1298 the palazzo de' Signori or palazzo Vecchio (VILLANI, viii, 26), resembling that of Casentino, built by his reputed father Lapo, i. e. Jacopo; it was altered by Taddeo Gaddi and by Michelozzo (MILIZIA); and the whole building was largely altered in 1551 by VASARI, who states the difficulties which beset Arnolfo in this work; and gives the epitaph placed on the side of the church of Sta. Maria del Fiore opposite to the campanile. Arnolfo died in 1310 according to the *Necrologia di Sta. Maria Reparata*. His minor works are mentioned by SCHORN, i, 79-80; by RUMOHR, ii, 157; and by MARCHESI, i, 62, 63.

**CAMBOGE**, generally spelt **GAMBOGE**. A gum-resin containing about 75 per cent. of resin and 25 per cent. of arabin. It was introduced about 1603 into Europe; the plant from which

it is obtained is not known, but the *xanthochymus ovalifolius* and a species of *garcinia* are supposed to furnish respectively the camboge from Ceylon (no longer known in the English market) and from Siam. The bruised leaves and the young branches of the *garcinia* (the *ocycarpus* or *stalagmites*) and of the *hebra-dendron*, give a juice, more or less intensely yellow in colour according to the age or the portion of the tree, and the season of the year at which the juice is extracted, which is allowed to thicken, and then formed into rolls, called pipe camboge; this is the purest; the cakes are not always of the natural production, but somewhat manufactured. Camboge is used as a pigment for water colours, and in colouring lacquer varnish for brass work; it is almost entirely soluble in alcohol, and is not precipitated from solution by the addition of water; in water it forms an emulsion in which the resin is kept suspended by the gum. An artificial camboge is manufactured from turmeric and other ingredients. 14.

**CAMBRA** (JUAN) succeeded in 1601 to Juan Barresa and Juan de Ambuesa in the works of the monastery of S. Miguel de los Reyes at Valencia in Spain: he constructed the façade (*lienzo*) next to the capilla del Cristo; the chapel itself; the gates of the lower cloister, those of the principal staircase, and from the transept of the church to the upper cloister; and continued the Ionic order of that cloister. 66.

**CAMBRAI** or **CAMBRAY**. A city in the department of the Nord in France. The streets, which are well built, are enclosed by walls with old round towers, and defended by a very magnificent citadel; the place d'Armes (at one end of which is the *hôtel-de-ville*, modern but well built) is of great extent, and with the vast esplanade is a matter of pride to the citizens. Only two remain of the twelve churches existing before the Revolution of 1792, when the cathedral, designed by Villart de Honnecourt, and finished in 1182, was destroyed; a model of it, supposed to be existing in a relief-plan of the town, was taken by the Austrians to Vienna in 1815. The new cathedral of Notre Dame is of no great merit. The law courts, the *seminaire*, the *collège*, and the theatre, are the chief public buildings. 14. 28. 96.

**CAMBRIDGE**, formerly **GRANTEBRIGE**. An university, and the chief borough in the county of Cambridge in England, and situate on the navigable river Cam or Grant. The streets are mostly narrow and irregular, but clean and well lighted; some old houses exist in Bridge-street, Trinity-street, and Petty Cury: Merton hall or the school of Pythagoras, dating about 1200, is 60 ft. long by 21 ft. wide; KILNER, *Pythagoras School*, fol., London. The three public bridges are of cast iron, each having one elliptic arch; that of Garret Hostel, 60 ft. span, erected in 1835 by W. C. Mylne, is given in HANN and HOSKING, *Bridges*, 8vo., London, 1843, pl. 95-7, p. clvii; each college contiguous to the river has one or more private bridges.

Of the sixteen churches, that of S. Benet is remarkable for its supposed Saxon tower (RICKMAN, *Attempt*, etc., ed. 1848, app. xxii); S. Sepulchre, 41 ft. internal diameter, one of the four round churches remaining in England, was consecrated in 1101, the chancel and aisle erected in 1313 or 1350; it was restored to its present appearance 1843-5, under the direction of the Cambridge Camden Society (BRITTON, *Arch. Antiq.*, 4to., London, 1807, i; ARCHÆOLOGIA, vi, 163): S. Andrew the Less, c. 1250; S. Mary the Less, c. 1327, by Alan de Walsingham; Holy Trinity, from about 1270; Great S. Mary or the university church, 1478-1519, by John Alcock then bishop of Worcester, the tower, 1593-1608; *Transactions of the CAMBRIDGE CAMDEN SOCIETY*; and S. Michael, 1324, restored in 1850 by G. G. Scott. There are ten other churches of later date. The pulpits of Trinity, S. Mary the Great, S. Andrew the Great, and S. Paul's churches, are singular in their plan, each having a staircase round a central newel entirely within the sides of the pulpit. There are seven other places of public worship, including a Roman Catholic chapel (Early English), 1842, by A. W. Pugin. The cemetery was laid out and lodge designed by J. Smith, and a



chapel erected 1856 by G. G. Scott. The dissenters' cemetery was laid out by C. J. Loudon, and the buildings designed by E. B. Lamb, 1843; COMP. TO THE ALMANACK, 1844, 231.

The colleges are seventeen in number, and consist of—

S. Peter's, founded in 1284, has three courts; the largest is 144 ft. by 84 ft.; the second court is cased with Ketton stone; the third or Gisborne court was erected in 1825 by W. Brookes. The chapel, 1632, is 55 ft. long, 27 ft. wide, and 27 ft. high; the hall is 48 ft. long and 24 ft. wide.

Clare, 1326, has one court about 150 ft. by 111 ft.; the chapel (Italian), 1763-9 of Ketton stone, is by James Essex from the designs of Sir James Burrough, and cost £7,000; the hall is 69 ft. long, 21 ft. wide, and 25 ft. high. The bridge, by Robert Grumbold (circa 1638), has three semicircular arches, the centre having a span of 22 ft.

Pembroke, 1343, has three courts; the first about 96 ft. by 54 ft. The chapel by Sir C. Wren (1665) is 54 ft. long, 24 ft. wide, and 30 ft. high. The hall is 42 ft. long and 27 ft. wide.

Gonville and Caius, 1348, has three courts; Caius court, with the gates of Virtue, 1565, of Honour, finished in 1574, and of Humility, are attributed to John of Padua; the chapel was rebuilt in the beginning of the last century; the hall, 74 ft. long and 32 ft. wide, was erected and extensive repairs effected in 1853 by A. Salvin.

Trinity hall, 1350, has two courts; the chapel, 43 ft. long by 18 ft. wide, is in great part modern; the hall is 36 ft. long, 24 ft. wide, and 25 ft. high. This college was restored by A. Salvin in 1852 after a fire. The contract for its erection, 1350, exists in BAKER'S MSS.

Corpus Christi, 1351, has two courts, one 158 ft. by 129 ft.; the college was almost entirely rebuilt in 1823 by W. Wilkins; the chapel is 65 ft. long, 24 ft. wide, and 35 ft. high; the hall is 62 ft. long, 27 ft. wide, and 35 ft. high; the library is 87 ft. long, 22 ft. wide, and 25 ft. high.

Kings', 1441, has one court 282 ft. by 240 ft. The chapel was commenced by Henry VI; Nicholas Cloos or Close, bishop of Lichfield, manager of the works, died in 1453, and either he or his father is supposed to have been the architect; John Canterbury of Tewksbury, a fellow, was clerk of the works in 1451. But little more than the foundation was finished at the time of the founder's death in 1461 (who granted the quarry of Thedale and two at Huddlestone, all in Yorkshire, to the fellows), until 1479, when from that time to 1483 Dr. Field, provost, was overseer, John Wulrich, master mason, and John Bell, mason warden, 1476; in 1484, Thomas Cliff, overseer, the chapel was raised at the east end to the top of the window (the other parts being not yet carried up so high), and the two eastern chantries on the north side covered in. The works appear to have been suspended until 1508, and the "case" of the building was finished in 1515. The contracts state that the vaulted roof executed in stone from the Weldon quarries (now exhausted) in Northamptonshire by John Wastell, master mason, and Henry Semerk, warden, was begun and completed within two years and a half. The two porches are vaulted with Ham-pole stone (Yorkshire); the battlements to eighteen chapels and the two porches are of Weldon stone. Twenty-two of the upper windows were ordered to be filled with painted glass (1526), the four others and the chantry lights are undated; SCHARF, in *Journal of the Archaeological Inst.*, 1856; Cole's MS. collection for Cambridge in the British Museum, partly printed in MALDEN'S *Account of King's College Chapel*, 8vo., Cambridge, 1769; and in WALFOLLE, *Anec. of Painting*; the will of Henry VI, in NICHOLS, *Collection of Royal Wills*, 4to., 1780. The panels of the vaulted ceiling vary from 4 to 6 ins. in thickness; the roof above is constructed of chesnut wood. The total length of the chapel inside, stated in the Will to be 288 ft. by 40 ft. by 90 ft. high, is 289 ft., width 42 ft.; outside including chapels 77 ft. 4 ins.; height inside to apex of vaulting 80 ft. The screen and stalls were executed during the reign of Henry VIII. This building, which has neither been re-

stored nor repaired, is given in BRITTON, *Architectural Antiquities*, 4to., London, 1807, i; the *Construction of the Roof*, in TREDGOLD, *Carpentry*, 3rd edit., 1840; also by MACKENZIE, pamphlet, 4to., 1840; and by WILLIS, in *Transactions of the Royal Inst. of Brit. Architects*, 1842, i, pt. 2, p. 45. The fellows' building, having 236 ft. frontage on the western side of the court, was commenced in 1724 by James Gibbs; it is given in his *Book of Architecture*, fol., London, 1728, with designs for the two other sides. The hall and offices on the south side, 509 ft. long, were erected in 1828 by W. Wilkins; the provost's lodge, 97 ft. long, occupies the end nearer the river. The hall in this portion of the college is 102 ft. long, 36 ft. wide, and 40 ft. high; and the library adjoining is 93 ft. long, 27 ft. wide, and 18 ft. high. The bridge, by W. Wilkins, has one segmental arch of 55 ft. span; it is executed in Callado or Carlado (Fifeshire) stone.

Queens', 1446, refounded 1465, has three courts, all of brick-work; one 96 ft. by 84 ft., the second or Walnut Tree court is 80 ft. square, and the third contains the president's lodge and cloisters; the chapel is 54 ft. long and 21 ft. wide; the hall is 53 ft. long and 27 ft. wide. The college MSS. contain the contracts for the erection of the buildings. The foot bridge of one span, known as the "mathematical bridge", was erected in 1746 of oak; the floor is formed of a series of steps supported by the framing of the parapets, the arrangement of the timbers being similar in principle to the centering of Waterloo bridge; a view is given in HARRADEN, p. 103, and in LE KEUX, i.

S. Catherine, 1475, rebuilt about 1700, has one court 180 ft. by 120 ft.: the chapel, built of brick, and consecrated in 1704, is 75 ft. long, 30 ft. wide, and 36 ft. high; the hall is 42 ft. long, 24 ft. wide, and 24 ft. high.

Jesus, 1496, has three courts; one 141 ft. by 120 ft.; the second has cloisters; they were probably designed by J. Alcock, bishop of Ely, who founded the college. The chapel, originally the church of the convent (*temp.* Henry II) which stood on the site, is cruciform, it was restored in 1845-47 by A. Salvin; the organ case, choir screen, and stalls, were designed 1848 by A. W. Pugin; *CIVIL ENGINEER Journal*, x, 109, xii, 32. The hall is 54 ft. long, 27 ft. wide, and 30 ft. high, with an open timber roof, given in SMITH, *Carpentry*, 4to., 1787.

Christ's, 1505, has two courts; one 138 ft. by 120 ft.; the second contains chambers of Ketton stone, 1642, by Inigo Jones, 150 ft. long, by whom the rest of the court was repaired and cased with stone. The chapel is 85 ft. long, 27 ft. wide, and 30 ft. high. The gateway and part of the front were erected soon after the foundation. The hall is 45 ft. long by 27 ft. wide.

S. John's, 1511, has four courts; the first, 228 ft. by 216 ft., was completed about 1515; the second, 270 ft. by 240 ft., in 1599; the third, containing the library 150 ft. long, in 1624; and the fourth, 480 ft. by 180 ft., in 1827, by T. Rickman. The chapel, 120 ft. long by 27 ft. wide, has carved stalls; Fisher's chantry is richly decorated. The hall is 60 ft. long and 30 ft. wide. The old bridge, later in detail, is of similar character to that of Clare. The new bridge (Perpendicular), roofed over, has one segmental arch of 50 ft. span, and was erected in 1827 by T. Rickman.

Magdalene, 1519, has two courts; the larger is 110 ft. by 78 ft. The chapel is 50 ft. by 18 ft.; the former ceiling was removed and the carved oak roof was repaired in 1849; the second court contains the Pepysian library.

Trinity, 1546, is internally probably the finest in the world; it has three courts; the first, 335 ft. by 275 ft., the octagonal stone conduit in the centre dates before 1655; Neville's court, 273 ft. by 192 ft.; New court or King's court (Tudor), 164 ft. by 150 ft., completed in 1826 by W. Wilkins, cost £40,000, and contains accommodation for 120 students (GENTLEMEN'S MAGAZINE 1827). The great entrance tower is of the period of Henry VIII. The library, 190 ft. long, 40 ft. wide, and 38 ft. high, is by Sir C. Wren; the cases are of Norway oak. The chapel, completed in 1564, is 204 ft. long, 34 ft.



wide, and 44 ft. high; the stalls were carved by Gibbons. The hall is 102 ft. long, 40 ft. wide, and 56 ft. high, having an open timber roof (a view of the screen is given in the *ILLUSTRATED NEWS*, xi, 24, and other illustrations p. 17, et seq.) The bridge, by James Essex, has three cycloidal arches, the centre one is 20 ft. 3 ins. span.

Emmanuel, 1584, has one court, 128 ft. by 107 ft. The chapel, by Sir C. Wren, was completed in 1677; it is 84 ft. long, 30 ft. wide, and 27 ft. high. The hall is 68 ft. long by 26 ft. wide.

Sidney Sussex, 1596 or 8, has two courts, completed in 1598, of red brick. The chapel, rebuilt 1780, is 41 ft. long by 22 ft. wide. The library was rebuilt about the same time. The hall is 60 ft. long by 27 ft. wide. Some alterations were made and the buildings stuccoed in 1832 by Sir Jeffrey Wyattville.

And lastly Downing (Grecian), 1800, commenced in 1807 by W. Wilkins; two sides only of the quadrangle are completed; they cost more than £60,000, and are of Ketton stone.

The public buildings belonging to the university are: the schools, which form the ground floor of a quadrangle, the west side of which dates about the end of the fourteenth century; the north side about 1400; the south side 1456-58; the east side 1755: the original gateway, removed by Sir John Cotton (who died in 1712), during some alterations, now forms part of Madingley hall: the university library, now containing about 200,000 volumes, is on the first floor, also forming a quadrangle, the sides of which are of about the same date as the schools respectively; a fifth room, 167 ft. long, 45 ft. wide, and 36 ft. high, was added 1839 by C. R. Cockerell, in Whitby and Portland stones; the library is on tile arches, and the ceiling is a vault formed of hollow pots (*COMPANION TO THE ALMANACK*, 1840, p. 237): the senate house, 1722-30, from the designs of Sir James Burrough, altered by James Gibbs, in Portland stone, cost about £20,000; it is 101 ft. long, 42 ft. wide, and 32 ft. high: the observatory, 1822-4, by J. C. Meade, of Bath stone; the total cost was £19,241: the anatomical museum, 1830, by C. Humphrey, a builder, cost £2,968: the University or Pitt press (Tudor), 1831-2, by E. Blore: the Fitzwilliam museum (Grecian Corinthian), commenced in 1837 by G. Basevi, and partially completed after his death in 1845 by C. R. Cockerell; *CIVIL ENGINEER Journal*, ix, 31, 129, 167, 361.

The other public buildings consist of the guildhall, by James Essex, in 1782; the shire hall, 1747; the county gaol, on an extensive plan of John Howard; the town gaol, 1829, by W. Brookes; the assize courts (Italian), 1842-3, by Messrs. Wyatt and Brandon, of Whitby stone, with a frontage of 102 ft., cost £11,000; *BAUZEITUNG Journal*, series ii, 180, *COMPANION TO THE ALMANACK*, 1843, p. 251, and *ILLUSTRATED NEWS*, 1843, p. 223; the corn exchange, 1842, by J. Smith; Addenbroke's hospital, 1753-66, enlarged in 1814, *WHITWELL, Warming, etc., of the Fever Wards, etc.*, 4to., Cambridge, 1834; and the railway station (Italian), 1845; the Perse almshouses (Tudor); Storey's almshouses, 1848, by J. Walter; the hospital of SS. Anthony and Eligius, 1852, by R. R. Rowe; the Perse grammar school, 1843, by J. Smith; six national schools, one by A. Poynter; Vicar's buildings, a model lodging house, 1854, by R. R. Rowe; the market-place contained Hobson's conduit supplied with water by an aqueduct three miles long, and erected 1614, which was removed in 1855, and is now replaced by another by G. M. Hills, erected of Ancaster and Bath stones, at a cost of £560, *BUILDER Journal*, xiii, 462. The botanic gardens and the public walks may be noticed.

ACKERMANN, *History of Camb.*, 4to., Lond., 1815; LE KEUX and WRIGHT, *Memorials of Camb.*, 4to., Lond., 1841-2; CARTER, *History of the County*, edit. by UPCOTT, 8vo., Lond., 1819; PUGIN, *Specimens of Gothic Architecture*, 4to., Lond., 1821; BASHFORTH, *Observations on some recent University Buildings*, Camb., 1853; *The Pictorial Guide*, printed for J. Hatt, 8vo.; *The Ecclesiastical, etc., Topography of England*, published by J. Parker, 8vo., Oxford, 1852; PALEY, *The Ecclesiologist's*

*Guide*, 8vo.; HARRADEN, *Cantabrigia*, 4to., 1814, 2nd edit.; BYRNE, *Views in Camb.*, fol., Lond., 1806; LOGGAN, *Cantabrigia Illust.*, fol., Camb., 1688; OBSERVATIONS ON OBSERVATORY PLANS, 8vo., Camb., 1822; STORER, *Cantabrigia*, 4to., Camb., 1835, and *Collegiorum Portæ*, 8vo.; SMITH, *Camb. Portfolio*, 4to., Lond., 1840; and COOPER, *Annals*, 8vo., Camb., 1856. The *ILLUSTRATED LONDON NEWS*, 1843, p. 296, gives a bird's-eye view, and vi, 393, a plan. A series of fifty views in photography of the principal colleges, etc., was published London, 1856.

R. R. R.

CAMBRIDGE. A town in the state of Massachusetts in North America. Besides sixteen churches, it possesses Harvard university, founded 1636, chiefly built of Quincy granite, and shewn in HINTON, *History, etc., of the United States*, 4to., London, 1834, ii, 340: the new (1841) library in a Pointed style (fourteenth century), in the shape of a Latin cross, containing in 1852, 92,000 bound volumes, is described in the *BUILDER Journal*, x, 467.

CAME. This word has been applied in two or more ways. At first it meant the whole quantity, 50 lbs., of lead which was the regular allowance to every hundred feet of glass: the glaziers cast that "came" into small slender rods (in Latin *calami*, as suggested by WINSTON, *Inquiry*, 8vo., Oxford, 1847, i, 335) of 12 or 14 ins. in length, and so much lead in that state was called the "came". Afterwards each such rod was called a came and was made, by being drawn through a vice, into a "glazier's turned-lead", or WINDOW-LEAD, with a groove upon each side to go upon or hold the glass.

4.

CAMELFORD, see PITT (THOMAS).

CAMERA or CAMARA (Gr. *καμάρα*). This term originally meant any curved covering (VITRUVIUS, ii, 4; vii, 2, 3, and 4; viii, 2), such as a piece of canvas laid over twigs bent into a semicircle and fastened into the ground; but afterwards anything with such a covering. Thus it is used for a trellis by PLINY, *Hist. Nat.*, xii, 4: xix, 24; while it is employed by SALLUST, *Catiline*, 55, and CICERO, *Ep. ad Quintum Fr.*, iii, 1, for a curved ceiling; and in general in contradistinction to LACUNAR for a flat one, and to FORNIX for a vault of masonry or brickwork: PLINY indicates, xvi, 64, that the timber construction was shewn, and that the intervals or bays were filled in with plastering; xxxv, 40, that Pausias (n.c. 350-300), a practitioner of encaustic work, first ornamented the camera with painted decorations; and xxxvi, 64, that Agrippa had employed mosaic work in such ceilings: PROPERTIUS, *Ecl.*, 3, ii, 10, speaks of gilded beams with bays of ivory; but PLINY, xxxiii, 15, of silver beams with bays of gold.

78. 79.

CAMERATED. A term employed as equivalent to "having a semicircular vaulted appearance" with respect to the church of S. Augustine, Watling-street, and others, by WREN, *Parentalia*, fol., London, 1750, pp. 310-17, who adds that at S. Sepulchre, Newgate-street, "the roof over the nave is camerated but flat".

CAMERINO (the Latin CAMERINUM). A city in the Papal States. The cathedral, said to occupy the ruins of a temple to Jupiter or to Bellona, was destroyed 1799 by an earthquake, all but the campanile and sacristy; and was rebuilt as a basilica with a nave and aisles by Andrea Vici as architect of the interior, and by Folchi as designer of the exterior, GIULIANO D'ESTE, *Ragionamento della Nuova Metropolitana*, Rome, 1838. The other chief buildings are the episcopal palace; the palace (formerly ducal) of the legate, with three large cortili; the palace of the magistracy; the university; the foundling hospital; twelve monasteries; and seven convents.

28. 96.

CAMERON (CHARLES) published *The Baths of the Romans explained and illustrated, with the Restorations of Palladio corrected and improved*, 75 plates, fol., London, 1772; and a second edition in 1775.

CAMERON (G. . . . .). GRANVILLE, *S. Petersburg*, 8vo., London, 1828, ii, 184, mentions "Cameron, the Scotch architect, who has left so many creditable monuments behind



him at S. Petersburg", but does not specify any of them: and J. L. Bond exhibited at the Royal Academy of Arts at London in 1793 a perspective elevation of a triumphal arch to be erected in the Crimea by G. Cameron, Esq., architect to the empress of Russia, probably that at BAGTCHESERAI.

CAMICIA (CHIMENTE), a Florentine, was much engaged in the service of Matthias Corvinus (king of Hungary 1458-90), for whom he designed palaces, gardens, fountains, churches, fortresses, and other buildings of importance, with their decorations. After a visit to Florence he returned to Hungary, where he died. 73.

CAMILLANI or CAMILLIANI (FRANCESCO), a Florentine, a pupil of Baccio Bandinelli, was chiefly engaged in the construction of fountains: one highly praised by VASARI, in v. *Giovanni Bologna*, contained 644 pieces of marble; it was removed in 1573 to Palermo under the inspection of Camillo Camilliani, an architect who was probably the son of the original designer. 68. 73.

CAMINO or CAMMIN, in Pomerania, see KAMMIN.

CAMLAPORE. A town contiguous to the ruins of Bijanagur, of which it was probably once a portion: near it are two magnificent Hindu temples resembling the principal ones in Bijanagur: the mud cottages are painted with red and white stripes, according to the practice prevalent in villages south of the river Krishna. 102.

CAMPAGNA. A city in the province of Principato Citeriore in the kingdom of Naples. The superb cathedral, dedicated to the Virgin, three churches, two monasteries and a convent, two seminari, the episcopal palace, and an hospital, are the chief architectural works. 96.

CAMPAMIOS, see CAMPOMASIA (JUAN).

CAMPANA or CAMPANULA, see BELL; GUTTA.

CAMPAN MARBLE. A calcareous ground or base with talcose veins, according to BRARD, *Mineralogie*, 8vo., Paris, 1821, ii, 328: the *Handbook for France*, 320, 321, observes that it is a transition limestone from the quarries of Espiadet in the val de Séoube, not from the val de Campan, where the rocks are Jura limestone. BRARD further notices that masons have assumed that there are three varieties, whereas one block often contains a specimen of each kind; these sorts are distinguished in commerce as—

Campan vert, which has a very pale green ground with darker green lines, forming a net with long meshes;

Campan isabelle, which has a delicate rose-coloured ground with undulating green talc veins; and

Campan rouge, which has a dull red ground with darker red veins;

but any fine specimen of Campan marble would exhibit all these mixed together, occupying each from a few inches to three or four feet of surface. As the talc exfoliates upon exposure, this marble is not fit for external work. RAMOND, *Observations*, 8vo., Paris, 1789, states that this marble is procured from the bourg of Campan, three miles from Bagnères, in the department of the Hautes Pyrenées. REPORTS OF THE JURIES, etc., 8vo., London, 1852, p. 27.

CAMPANILE. The term used in Italy to designate any kind of belfry, whether the tower of the Commons (a *campanile*, in French *clocher*, being both in Italy and France the sign of an independent community), or else belonging to a religious edifice; in this case, wherever the Lombard style is preserved in Italy, the tower is almost invariably found detached, or nearly so, from the main building; and thus forms, with the baptistery, the third edifice of the sacred group. The subject has been treated at some length by L'ANSON, *Detached Essay*; and *Illustrations*, pl. 1, 2, 13, 14, 15, 25, 26; and has been condensed by PAPWORTH, in the *Journal of the ARCHEOLOGICAL INSTITUTE*, 8vo., London, 1850. The distinguishing characteristic of the Italian campanile is the absence of buttresses, which gives them their great superiority over those of Northern Europe.

If remarkable exceptions to the following classification should  
ARCH. PUB. SOC.

appear to exist, they will be found to be more strictly military towers, and generally so named, such as the torre del Podestà at Pistoia, the torri Asinelli and Garisendi at Bologna, with others at Oneglia and Pavia; or else they have been converted to their present uses, such as the campanile of the church at Villanuova, formerly part of the feudal tower of the San Bonifazio, and in like manner that march-tower between Lombardy and the Venetian States, near the Porta del Consilio at Vicenza, has been perverted into the belfry of a church.

The first class, A.D. 400-650, is found at Ravenna, where the earliest towers may be deemed to have been cylindrical without very important string courses; the next step would be to build them square, also without large string courses; in this class the windows generally widen according to their distance from the ground, being usually a single light in the lower story, followed by a couplet in the next and a triplet above it.

The second class, A.D. 650-1000, is chiefly found at Rome; the tower of the cathedral at Uzès in France may be supposed to belong to this class, which exhibits round as well as square structures with strongly marked string courses, and in the later examples one or two couplet windows or a triplet in every story give a peculiar character of lightness.

The third class, A.D. 1000-250, comprehends the greater part of the Romanesque towers of northern Italy; they present a return to masses of wall, with less prominent string courses, and a preference for the verticality of their Gothic successors.

The fourth class comprises those built in a Pointed style, or with an evident prevalence of it, such as the campanile of Sta. Maria del Fiore at Florence, 1334, and the less noted tower of S. Andrea at Mantua.

But it seems preferable to consider as a fourth class, A.D. 1200-500, the campaniles of Venice, which are square without string courses, and divided on each side into two or three panels, running uninterruptedly from their base to their cornice, and crowned by a square or octagonal attic.

It will be found that the attempt to discriminate between the styles of various periods, although rendered difficult by the general resemblance of such structures, may through the marked differences existing in various localities, enable the student to continue their classification, by forming such divisions as the Revival in the Roman school; the Florentine Renaissance; and the Venetian late style: thus the Neapolitan, Genoese, and Lombard examples, given in the *Illustrations*, are easily recognized and grouped. BELFRY. BELL TOWER.

WILLIS, *Remarks*, 8vo., Cambridge, 1835, p. 144, has shewn that Italian campaniles possess generally peculiarly tall proportions and an unbroken perpendicular outline, which is seen in the *toraccio* at Cremona, and in the towers of civil edifices such as those at Florence and Siena, as well as in those attached to military and religious edifices in Italy. The adoption in London of these features by Wren has produced some of the finest modern examples out of Italy; still more recent are the campaniles at Streatham in Surrey, and Wilton in Wiltshire. Many specimens of ancient and modern works of this class are given in the *BUILDER Journal*, passim, and the subject is well treated by POUYARD in CANCELLIERI, *Le due Nuove Campanie di Campidoglio*, 4to., Rome, 1806, pp. 132-78.

CAMPANILUZZO. An Italian diminutive of campanile, applied depreciatingly to works like the well known turrets placed by Bernini on the portico of the Pantheon at Rome.

CAMPANULACEÆ. A natural order of plants, which has afforded many useful hints for architectural decoration, especially the rampion or campanula rapunculoides. DE CANDOLLE, *Monographie des Campanulacées*, 4to., Paris, 1830.

CAMPAZZO (DIONIGI) is entered under the date 1586 in the list of architects to the cathedral at Milan. 27.

CAMPBELL (COLEN or COLIN) erected the following works, viz.: 1712, a house at Shawfield in Glasgow, for Daniel Campbell, esq., *Vit. Brit.*, ii, 51; 1717, the front of Burlington house in Piccadilly, London, the conjunction from thence to the offices



(the eastern offices were by another hand), and the great gate and street wall thereof, iii, 22-25; 1718, the Rolls house in Chancery-lane, London, iii, 44, 45; and Eberston lodge, near Scarborough in Yorkshire, for W. Thompson, esq., iii, 47; 1715-20, the first and second designs for the mansion at Wanstead in Essex (taken down in 1834), i, 21, 26, for Sir Richard Child, afterwards earl Tylney (ACKERMANN, *Repository*, 8vo., London, 1824, iii, 249); and a design with angle pavilions, iii, 39-40, which are not seen in the perspective view as given by Watts, *Views*, London, 1779, pl. 56, who observes that Wentworth house, near Rotherham in Yorkshire, the seat of earl Fitzwilliam, was nearly a direct copy of it; 1720, a fishing lodge at Newby in Yorkshire, for Sir W. Robinson, bart., iii, 46; 1720-22, the centre of Stourhead in Wiltshire, for Henry Hoare, esq., iii, 41-43; 1723, the general design of the mansion at Houghton in Norfolk, for the right hon. Robert Walpole, iii, 27-34; NEALE, *Seats*, 4to., London, 1822, ser. I, iii, states that this building was finished 1735 by T. Ripley, to whom the domes and parts above the cornice, and the alterations of Campbell's portico and offices are probably to be attributed; 1723, Mere-worth castle, near Maidstone in Kent, for the hon. John Fane, an imitation of the villa Capri by Palladio, iii, 35-38, NEALE, 2, ii; 1724, the garden room at Hall Barn, near Beaconsfield in Berkshire, for Edmund Waller, esq., iii, 49, 50; and Goodwood, near Chichester in Sussex, for the duke of Richmond, iii, 51-54 (this was not executed): besides these there are undated house at Beverley in Yorkshire, for Sir C. Hotham, bart., ii, 87; and another at Chester-le-Street in Durham, for John Hedworth, esq., ii, 88. The appearance of his name with the epithet *architectus* to the plates authorizes the addition of a house, 1724, in Nottingham, for Mr. Plumpton, iii, 55, and the house of lord Herbert in Whitehall, London, iii, 48. He published the *Vitruvius Britannicus*, 3 vols., fol., London, 1715, 1717, and 1725, in which the above works are given, and also several *projects* by himself, as a bridge over the Thames near Lambeth, iii, 56; two churches, i, 8; ii, 27; and mansions, i, 19, 28, 53, 95; ii, 41, 83, 86, 89, 98; and iii, 98. In 1725 he was architect to the prince of Wales, and in 1726 surveyor to Greenwich Hospital during the erection of the west front of queen Ann's buildings, etc. He died in 1734; WALPOLE.

CAMP-CEILING or TENT-CEILING. This term is explained by STUART, *Diet.* s. v., as a roof "which has the ceiling under the rafters"; to which GWILT, *Encyc.* s. v., adds "convex inwardly".

CAMPELLO (GIOVANNI DI) added in 1360 the north porch and the canopy to the south porch of the cathedral at Bergamo; LUPI, *Codex*, 1784; BARTOLI, *Pittura*, 1774. 26. 28.

CAMPELLO (FRA FILIPPO DA) was present in 1228 at the debates upon the design for the great church of S. Francesco at Assisi, submitted by Jacopo il Tedesco, whom he succeeded in the superintendence of the work; ANGELI, *Collis Paradisi Amomitas*, quoted by CIOGNARA, *Storia*, fol., Venice, 1818, i, 345; he is said to have given additional width to the original or middle church by forming chapel-recesses between the piers, thus forming it into a nave with aisles and transepts, whereas the upper church has transepts but no aisles. A wheel-window from the church designed by him of Sta. Chiara, in 1253, also at Assisi, is given in pl. 73, *Illustrations*.

CAMPEN, see KAMPEN (JACOB and NICOLAAS VAN).

CAMPERIO (GIACOMO) is mentioned with Bertolino Bragerio in the following inscription, dated 1288, not 1388 as given in VAIRANI (67), "Hoc opus fecit magister Bertolinus Bragerius magister murii + hoc opus fecit magister Jacomus d Camperio magister murarie", to the cathedral at Cremona, which work consisted of the north and south transepts. 57.

CAMPERO (JUAN) erected in 1512 the church and convent of S. Francisco at Torrelaguna in Spain, destroyed by the French at the beginning of the nineteenth century. He was one of the nine architects consulted as to the new cathedral at Salamanca 3 September 1512, and commenced as aparejador

the construction of it 12 May 1513, under Juan Gil de Hontanón. When the work (with an aqueduct) was finished he went to Segovia, and 3 June 1524 contracted to remove a cloister from the site of the old cathedral to that of the new edifice, and also 18 June 1530 to give the cloister an additional height of three feet, and to add a new portal; on 17 March 1529 he undertook to add twenty-nine feet in height to the tower of the monastery of Sta. Maria del Parral in that city, and to replace the pinnacle roof. 66.

CAMPORA OFFICINALIS, Camphor wood is imported from China, Borneo, East Indies, etc., in logs and planks of large size; it is a coarse and soft wood, of a dirty greyish yellow colour, sometimes with broad iron-grey streaks, and is frequently spongy and difficult to work. It emits a strong camphor odour, and is used for making cabinets, turnery, etc.

CAMPI (ANTONIO), born at Cremona, whence he is called il Cremonese, was architect to pope Gregory XIII (1572-85). He died after 1591, according to ORETTI, *Memorie*, iv, 114. 26. 57.

CAMPI (FRA GIOVANNI DA), see BRACHETTI.

CAMPI (FRA RISTORO DA) and FRA SISTO DA FIRENZE, were born between the years 1220 and 1235. They were imitators or perhaps pupils of Jacopo il Tedesco and Niccolò da Pisa, and took the lay habit of the Dominican order, about the year 1256-57, at Florence, where they erected large roofs (*magnas testudines*, perhaps a cloister) to the palazzo dei Priori, also called del Podestà, now the Bargello (FINESCHI, *Memorie*), commenced in 1252 by Jacopo; and rebuilt with stone piers (VILLANI, *Croniche*, fol., Venice, 1537, vii, 34) the wooden ponte alla Carraja, which had been carried away in the flood of October 1269 (not 1264, as cited by VASARI, in v. Gaddi, who calls Fra Sisto, Fra Giovanni). VASARI, BALDINUCCI, LANZI, CIOGNARA, FINESCHI, and BITIOTTI, affirm that Fra Ristoro and Fra Sisto also rebuilt the ponte di Trinità, damaged at the same time; BORGHIGIANI (M.S. in the archives of the church of Sta. Maria Novella) mentions only the Trinità, and BOTTIGNO the Rubaconte, which last had not been injured by the flood. The *Guidebook* of 1841 attributes to them the church of S. Remigio, but that of 1842 disputes this point. The two lay-brothers commenced under Fra Pasquale dell' Ancisa as director of the works (he died in 1284) the church of Sta. Maria Novella, the first stone of which was laid 18 October 1278: and they were invited to Rome about 1280, to construct some vaulting (*primas testudines*). Fra Ristoro died at Florence in 1283; but Fra Sisto died at Rome in March 1289, having probably remained there to superintend the erection of the Dominican church of Sta. Maria sopra Minerva; for FONTANA, *De Rom. Prov. Ord. Prad.*, ii, 1, gratuitously asserts that the latter was unemployed for fourteen years, yet does not determine the name of the architect actually engaged upon that work. VASI, D'AGINCOURT, and others, give a century later for the date of erection of the present church. MASSELLI, editing *Vasari*, 8vo., Florence, 1832, quotes from BITIOTTI, that these artists were engaged at the palace of the Vatican and the church of S. Sisto. BRACHETTI; CAMBIO; GADDI. 87.

CAMPIGLIONE or CAMPILIONE, see CAMPIONE. Several persons of this name are mentioned by CIOGNARA, *Storia*, fol., Venice, 1818, i, 370-1, especially ARRIEO, employed 1322 on the pulpit and tower of the cathedral at Modena.

CAMPIO, see CAMBIO (ARNOLFO DI).

CAMPION (ZACHARIAS), residing in 1637 at Prague, is frequently mentioned in the archives of Strahov with respect to the new Premonstratensian seminary of S. Norbert in Prague. 20.

CAMPIONE (BONINO DA) is said to have been related to Andrea and other artists of the Fusina family (MAZZUCHELLI). He erected in 1350-75 the tomb of Cansignorio della Scala at Verona, which is inscribed "Hoc opus sculpsit et fecit Boninus di Campiglione Mediolanensis diocesis", as given by MAFFEI, *Verona Illustrata*, 4to., Verona, 1731, iii, 143. He was frequently consulted between the years 1388 and 1390 upon the works of the cathedral at Milan. PISA (BONANNO DI). 27.

CAMPIONE (JACOPO DA) occurs under the date 20 March 1388 in the list of architects to the cathedral at Milan. He erected with Niccolò da Selli, for Giovanni Galeazzo Visconti, 1378-1402, the church of the Certosa at Pavia, and died in 1398. AHRLER. 26. 27.

CAMPIONE (MARCO DA) commences the list above named in 1387; he died 8 July 1390. He is also said to have been the architect of the church of the Certosa at Pavia. 27. 28.

CAMPIONE (MATTEO DA) occurs under the date 1389 in the same list; he was buried in the cathedral at Monza, with the inscription "Hic jacet ille magnus edificator magister Matteus de Campilono qui hujus sacrosanctæ ecclesiæ faciendam edificavit evangelicorium et baptisterium: qui obiit a.d. 1399"; given in GALLY KNIGHT, *Eccles. Arch. of Italy*, fol., London, 1842. 27.

CAMPIONE (SIMONE DA) occurs under the date 1389 in the same list. 27.

CAMPIONE (ZENONE DA) occurs under the date 20 March 1388 in the same list. 27.

CAMPLI or CAMPOLI. A city in the province of Abruzzi Ulteriore in the kingdom of Naples. It contains an old and majestic cathedral, three churches, an abbey of Celestines, and several other religious and charitable establishments. 96.

CAMPO AGUERO (FRANCISCO DE) succeeded Rodrigo Gil de Hontanon at the cathedral at Segovia, where he was buried in the cloister, with the inscription "Aquí yace Francisco de Campo Agüero maestro que fue de esta santa iglesia de la obra de cantería: falleció á 12 de Setiembre de 1660." He was succeeded by Biadéro. 3. 66.

CAMPOMASIA or CAMPAMIOS (JEAN) of Normandy, and his partner Jean Mignotte of Paris, are entered under the date 1399 in the list of architects to the cathedral at Milan; but Mignotte only is afterwards mentioned by GIULINI, *Memorie*, 4to., Milan, 1771, xi, 456. 27.

CAMPORESI (FRANCESCO), son of a Bolognese sculptor of ornament (Giambattista, who died 1789, aged 65), was sculptor and architect to the Russian court at Moscow, where several views were supplied by him to illustrate CLARKE, *Travels*, 4to., London, 1810. 105.

CAMPORESI (PIETRO) built in 1779 the church of S. Ursula at Rome; finished in 1790 the entrance which Simonetti had commenced, under the popes Clement XIII and Pius VI, to the saloons of the museum in the Vatican (ROSSINI, *Monumenti*); and published in thirty-six plates engraved by Ottaviani the *grotesche* by Giovanni da Udine in the Vatican. 68.

CAMPO SANTO. The Italian term for CEMETERY.

CAMPSALE (ROBERT DE) was 'clerk of the works' at the palace of Westminster and at the Tower from 1355 till 1358; BRITTON and BRAYLEY, *History*, 8vo., London, 1836, p. 149.

CAMP SHEETING, commonly written CAMSHEDDING. A species of wooden construction placed round the base of a construction erected upon marshy or compressible foundations, for the purpose of confining the compression of the subsoil to the portion immediately within the vertical lines of the sheeting: it is also used as a retaining wall to the banks of rivers and canals. The best works of this description are executed with guide piles, A, and horizontal waling pieces, B, filled in with smaller piling (sheet-piling) or with planking, C. According to another method the camp sheeting or stout boarding, C, is spiked behind or sometimes in front of the guide piles, and the whole is finished with a cap-cill, B. GWILT, *Encyc. s. v.*, explains this term as merely the cap or sill of a wharf wall, whether of brick, stone, or piling; but this is called a camp-shoot or camp-shot. C. R. R.

CAMUS DE MEZIERES (NICOLAS LE) was born at Paris 26 March 1721, and died 17 July 1789 according to the *Bio-graphie Universelle* and *Penny Cyclopædia*, but 27 July 1789 according to QUERRARD, or 24 July 1779 according to CHAMBERS, *Bibl. Dict.* He is mentioned by BLONDEL, *Cours*, 8vo., ARCH. PUB. SOC.

Paris, 1771, ii, 290, as the architect of a "Vauxhall" being constructed in the Champs Elysées at Paris; and i, 108, as the architect of the *halle au blé* (1763-66). He published *Recueil de differents plans et dessins concernant la nouvelle halle aux grains*, fol., Paris, 1769, which is a rare work; *Dissertation sur les bois de charpente*, 12mo., Paris, 1763, with Babuty Desgodetz, for the Society of Architectes Experts; *Le génie de l'architecture, ou l'analogie des arts avec nos sensations*, 8vo., Paris, 1780; *Le guide de ceux qui veulent bâtir*, 8vo., Paris, 1781; *Traité de la force des bois*, 8vo., Paris, 1782. Under the name of Wolf d'Orfeuil, he is said to have written the *Esprit des almanachs*, 12mo., Paris, 1782. VIEL has reported upon the ruptures seen in the halle au blé. An abbé le Camus, probably his uncle, appears in the register of the Academy of Architecture at Paris, as elected in 1730 and deceased in 1768.

CAN. The Scottish term for a chimney pot. The term canflue is used by LOUDON, *Ency. of Gardening*, 8vo., London, 1850, p. 604, for a series of earthenware pipes, placed at their joints on brick piers, "long time since used by the Dutch, embedded in sand, and for the last fifty years occasionally in England", for heating greenhouses, etc.

CANADIAN TIMBER. The general name given to the timber of the genera ABIES, LARIX, PINUS, and QUERCUS, supplied to the English market from North America, the greater portion being felled in the British possessions. Miramichi supplying the best yellow deals, S. Andrew's and S. John's supplying white spruce deals (*abies Canadensis*), and Pictou, all in New Brunswick; Halifax in Nova Scotia; and the ports of Prince Edward's Island, are not literally Canadian ports, although timber from them is naturally confounded with that sent from places in Canada, such as Stanstead and S. John's, or small ports like Quenté Bay, Coteau du Lac, Mitis, etc., on the banks of the river S. Lawrence, from lake Ontario to about two hundred miles below Quebec.

Quebec, indeed, is the chief Canadian port for the exportation of timber, which is felled in winter and being then called *lumber*, is either cut at local water-mills, having saws set about 3½ ins. apart, and then sent in craft or floats, or else is taken in rafts as logs down the river S. Lawrence, which reach England and other markets if not converted into planks, etc., at Quebec.

The chief North American woods used for buildings are *abies Canadensis*, hemlock spruce, supplying white timber: *abies alba* and *nigra*, supplying white spruce deals; *pinus rubra* or *resinosa*, red pine, also called yellow (from the colour of the bark) and Norway pine in the northern part of the United States, the best deals from which come from the rivière du Loup in Canada; and are often mixed with yellow deals; *pinus mitis*, short leaved, or New York pine, called yellow pine in the southern part of the United States and in England, but spruce pine in Georgia and the Carolinas; this with *pinus australis* or *palustris*, long leaved, or southern, pine, called Georgia pitch pine in England and the West Indies, but yellow pine and pitch pine in the northern part of the United States, give *yellow deal*, the best of which comes from the rivière du Loup in Canada; *pinus rigida*, pitch pine, or black pine, also called sap pine, a native of Maine, Vermont, Georgia, and Virginia; *pinus strobus*, white pine of Canada and the United States, apple or sapling pine of New Hampshire and Maine; *quercus alba*, white or Quebec oak, of Vermont; *robinia pseudo-acacia*, locust wood, chiefly used for treenails; these are all sent to England, but *thuya occidentalis*, American arbor vitæ or white cedar; varieties of *juniperus*, red cedar; *larix Americana*, haematac or tamarack; and varieties of *betula fagus* and *fraxinus*, employed in construction, do not leave the American ports in large quantities, except as consignments to the West Indian Islands.

Wilmington in North Carolina, and Savannah in Georgia, export the *pinus australis*; New York furnishes the *pinus mitis* and the *pinus strobus*; Boston in Massachusetts, and Salem in New Jersey, supply the same *pinus strobus*; Charlestown in New Hampshire, exports pitch pine; and Portland in Maine,



furnishes deals cut in Canada, these are ports of the United States. MICHAUX, *North American Sylva*, 4to., Philadelphia, 1817; BRITTON, Prize Essay on *Timber*, in the library of the Royal Institute of British Architects; *Report from the Select Committee on Timber Duties*, fol., London, 1835. A list of the ornamental woods applied to furniture will be found in the *REPORTS OF THE JURIES*, 8vo., London, 1852, 104, et seq.

CANAL BIANCA and CANAL GRANDE MARBLES, see CARRARA MARBLE.

CANALE, see TAGLIACCOZZO CANALE (NICOLA).

CANALI (PAOLO), born about 1618, designed the *regia scala* in the palazzo Fantuzzi; the church of the RR. Madri di Sta. Maria Nuova; the façade to the left hand on entering the cortile of the palazzo Maggiore del Pubblico; and the alignment of the Strada del Monte, 1660, at Bologna. He died in 1680. 94. 105.

CANALIS, signifying a gutter, VITRUVIUS, vii, 4, is used by LIVY, xxiii, 31, for a narrow passage or alley in a town; the English words *canal* and *channel*, which are derived from it, are applied in conformity with the text of VITRUVIUS, iv, 3, to the sunk portions (*canaliculi*) of the face of a triglyph; and iii, 5, to the spiral groove on the face of the capital of an Ionic order, beginning at the eye, and expanding in width below its fillets until the necessary number of revolutions are completed where the two canals are joined in the middle of the capital. In the Erechtheum at Athens, and other cases, there is more than one canal to each volute. 2.

CANAL and CHANNEL have also sometimes been used to express a flute in the shaft of a column or pilaster. 2.

CANAL OF A CORONA. The portion recessed upwards on the soffit of the corona (Fr. *larmier*) of a cornice or string course, so as to leave a BEAK in order to prevent water from running under the base of the corona. 2.

CANAR or CANNAR (Sp. *Cañar*). One of the few remaining examples of the old Peruvian architecture, called Ingapilca and the fortress of Canar, exists southward of the mountains called the Paramo del Assuay, and on the road from Riobamba to Cuenca. Connected with a series of fortifications, about 463 ft. in length, is a little hill terminated by a platform surrounded by a wall about 17 ft. high, of large cut stones, which encloses a very regular ellipse of about 125 ft. long on the major axis. In the centre of this fortress, as it is generally called, which is more remarkable for its state of preservation than for its size, is a building about 23 ft. high, consisting of two apartments, each 20 ft. long by 7 ft. 6 ins. wide, constructed like the surrounding works with regular masonry in large blocks. The material is trapean porphyry of great hardness, enclosing feldspar and amphibole, perhaps quarried at two and a third miles in height, near the lake de la Culebrilla or the Serpent lake, three leagues from Canar. To cut the stones for the buildings at Canar at so great a height, and to transport them ten miles, is equal to any of the works of the ancients. The joints between the blocks would be hardly perceptible, if the stones were not worked *allo bugnato* or rusticated; each door and niche diminishes from the sill upward (*rastremata* in Italian); the walls are hollowed out for niches or cupboards (*hocos* in Spanish); and there are saddle-pins or cloak-pins of stone projecting about 19 ins. from the face of the inner walls; all these points correspond to the description of the building at CALLO, near Mulalo, and tend to the inference that this was a TAMBO or military edifice, serving as a resting-place for the Incas when passing from Peru to Quito: the most curious feature of each room is the stone which at each corner of the apartment has been left as an angle-corbels, and has afterwards been pierced with a hole, perhaps to receive a hammock-rope. The gables indicate a **A** roof; but DE LA CONDAMINE, in the *Mémoires de l'Académie de Berlin*, 1746, p. 444, stated that the gabled portions were of dried brick, and that they might not be more ancient than the European conquest; while HUMBOLDT, *Atlas Pittoresque*, fol., Paris, 1810, p. 109, 116, pl. 17, 20, was of opinion

that the gables, except as to the windows in them, were original, because he had been told that the roofs had consisted of thin slabs of stone.

CANARDIERE, sometimes also called SWALLOW'S-NEST. A small sentry box, made either of wood or stone, erected at the angles of fortifications. BRETESS. 2. 5. 25.

CANARY WOOD. The English name of a LAURUS.

CANCELLUS, generally used in the plural, CANCELLI. The Latin term for an interwoven or latticed division of any kind, as well as in later times for a BALUSTRADE and a RAILING. For instance, the sheepfold, *ovile*, or *septum*, was formed by cancelli; and these words were metaphorically applied to the divisions which kept each tribe separate, when voting in the Forum at Rome, by LUCAN, *Phars.*, ii, 197, and as by CICERO, *Orat. pro Sext.*, 37, who, *Orat. in Verrem*, 2, iii, 59, also allegorically uses the term cancelli for a boundary. These barriers in the Forum appear to have been originally of rope, then of wood, and finally of stone. Similar barriers to the rostrum in the Forum are supposed to be represented on the arch of Constantine; such barriers were erected to enclose fronts of temples, as is evident on coins of the temple of Antoninus and Faustina, as also on the podium of the amphitheatres to separate the spectators from the animals: D'AGINCOURT, *History of Art*, fol., London, 1847, Sculpture, pl. x.

VARRO, *R. R.*, 3, v, 4, describes *cancelli* as a trellis made with sloping battens **X**; in which it differed from the grate of upright bars: CLATHRUS. Cancelli or barriers, now called the BAR, were employed in the basilicas, when courts of law, to separate the judges and their assistants from the auditors, and thence the English word CHANCERY is derived; as well as in the basilican churches, to separate the sacrarium or presbyterium from the rest of the edifice, and thence the English word CHANCEL is derived. The term SCREEN is perhaps the only English word which embraces the varieties of wooden, metal, and stone cancelli of the middle ages, described by PUGIN, *Treatise*, 4to., London, 1851; and of the period of the Renaissance, which are so magnificent in Italy and Spain, as well as the Indian perforated stonework, given in KITTOE, *Illustrations*, fol., Calcutta, 1838. 79.

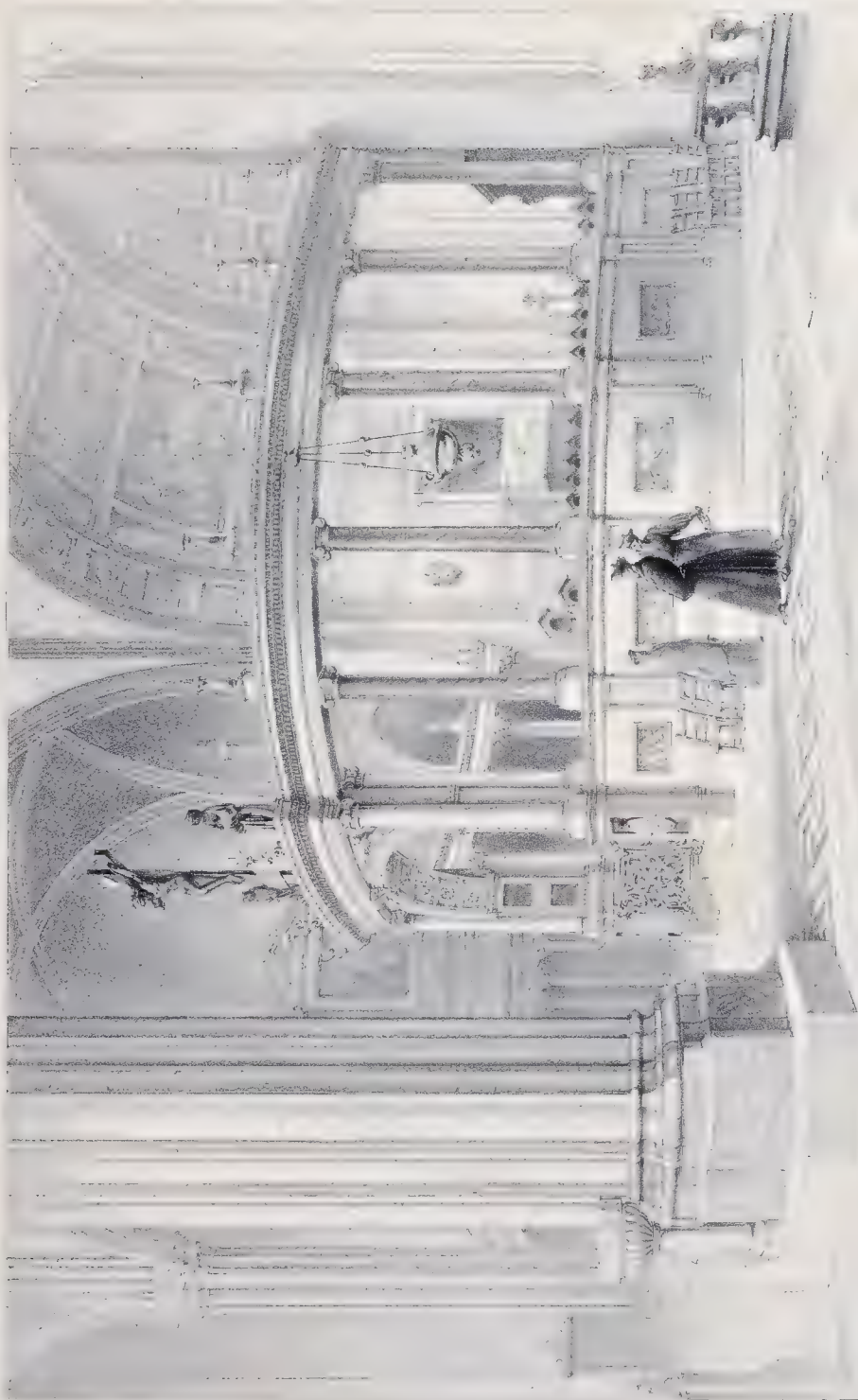
CANDAHAR, in Afghanistan, see KANDAHAR.

CANDAMO DE LAS TABLAS (JUAN DE) finished in 1479 the construction of the chapels on each side of the choir of the cathedral at Oviedo in Spain; his epitaph is given by LLAGUNO, *Noticias*, 4to., Madrid, 1829, i, 122.

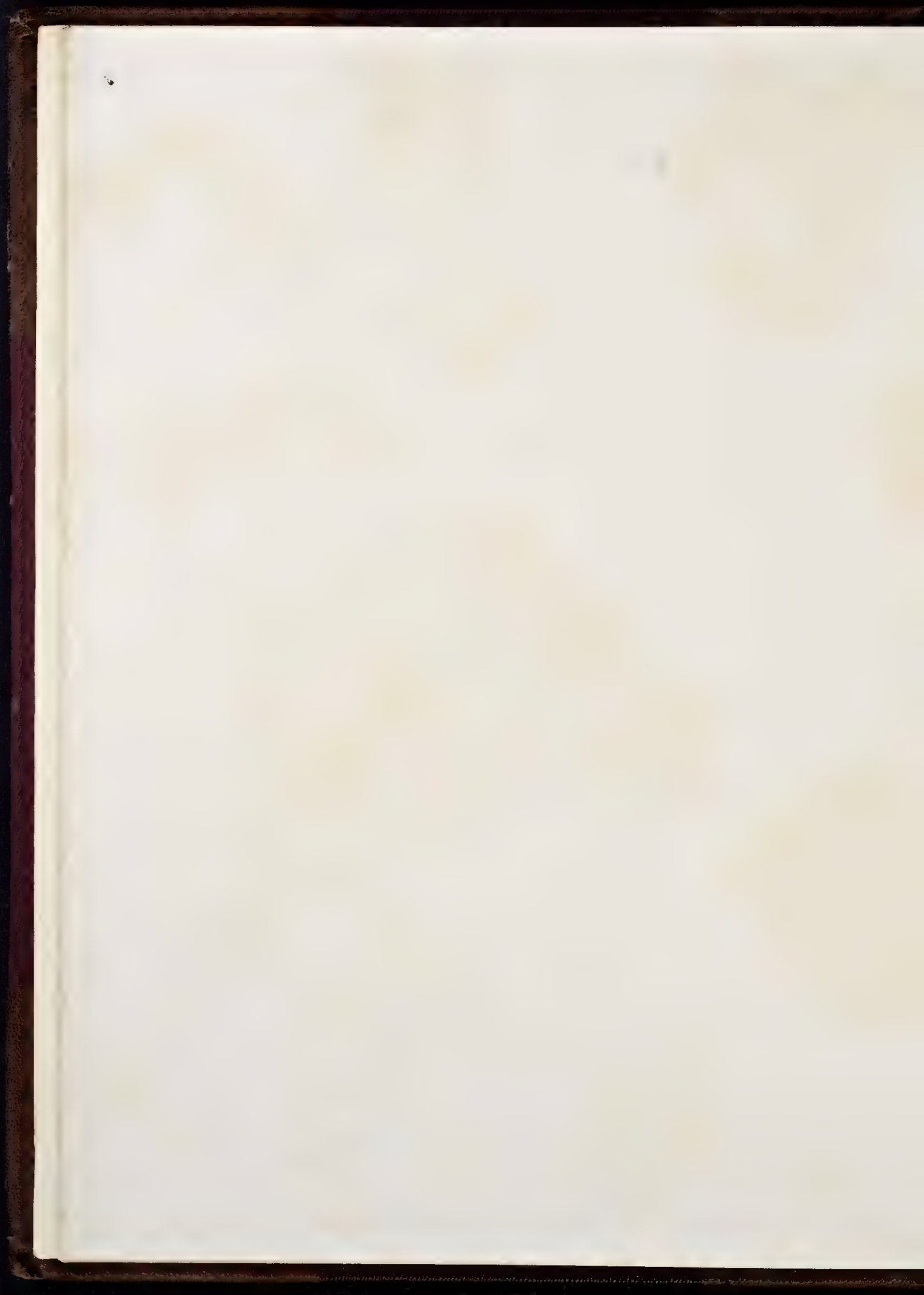
CANDELABRUM. A support for one or more lights. MARINI, *Sopra gli Usi dei Candelabri*, has considered whether the altar as a hearth, the brazier, and the tripod, should be called candelabra. The simple form of a candlestick, mentioned by FESTUS, s. v., and by VARRO, *L. L.*, iv, occurs with a socket in an example found at Pompeii, MACROBIUS, *Saturn.*, iii, 4; as well as with a spike, on a gem mentioned by VISCONTI, *Museo Pio-Clementino*, iv, for wax and tallow candles were invented before oil lamps, and continued to be used by the poorer Romans.

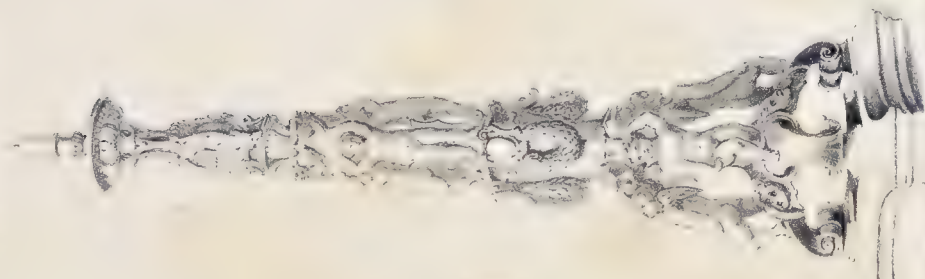
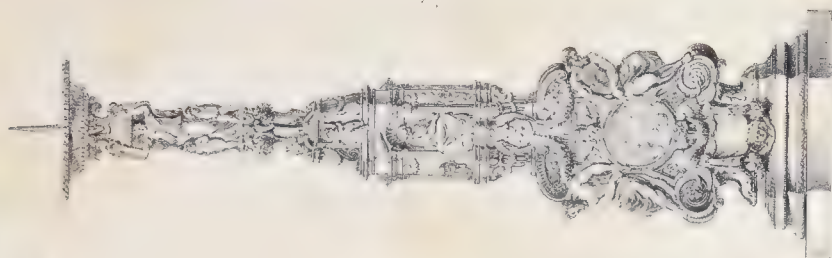
The Jewish candelabrum for seven lights is supposed to be faithfully represented on the arch of Titus at Rome. ATHERNEUS, *Deipnos.* xv, 60, giving much information as to the names and the various sorts of lights, besides quoting a curious passage of EUPHORBION, *Comm. Hist.*, mentions the *λύχνιον* or *λύχνα* dedicated in the prytaneum of the Tarentines by the younger Dionysius, when tyrant of Sicily, and which held as many lamps as there were days in the year; the same author, v, 40, adds a note from POLYCLETUS of a wonderful candelabrum made for a Persian king. There was probably a candelabrum in the Erechtheum at Athens to carry the lamp sacred to Minerva, which burned day and night, the work of Callimachus, the smoke from which was carried off by means of a bronze palm tree placed over the lamp, and which rose up to the roof; PAUSANIAS, *Descr. Gr.*, i, xxvi.

As a lamp-stand, the candelabrum was sometimes made of

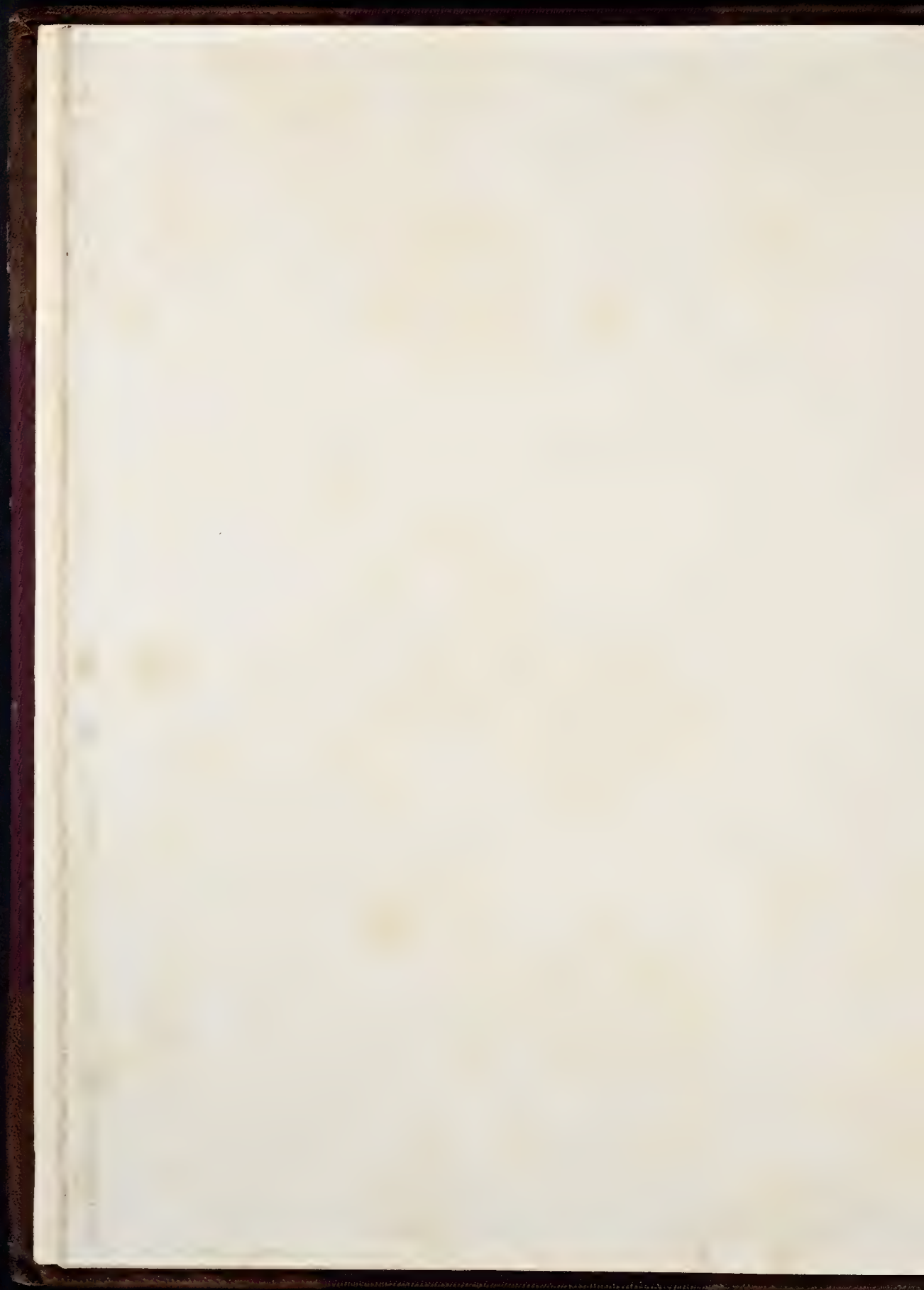












## CANDELABRUM



S. Laurence, NUREMBERG

Gebald, N. NUREMBERG

Church st. LEAU





wood, MARTIAL, *Epigr.*, xiv, 44, but chiefly of metal, and was even decorated with jewels, as that of silver intended to be dedicated to Jupiter Capitolinus, CICERO, in *Verrem*, 2, iv, 28; it was sometimes low (*humile* of QUINTILIAN, *Inst.*, 6, iii, 99), of which an example occurs in a tripodal stand and lamp found at Pompeii (here the tripod is a true candelabrum); or if not small, then of sizes varying from one to six feet in height, but still portable from its lightness: it then consisted of a *scapus* or shaft, which generally imitated the stalk of some plant (several examples resembling a cane and a reed are in the British Museum) divided at the bottom into three supports as feet; or a tapering column, VITRUVIUS, vii, 3, plain or fluted, and rising from an ornamental base mostly carried by three lions' or griffins' feet (the tripodal origin was not easily forgotten), with acanthus leaves and the honeysuckle, or a similar ornament. An example of such a candelabrum in the *Museo Borbonico*, vi, pl. 61, from Pompeii, is made with a sliding inner shaft, so that the light might be raised or lowered at pleasure. The top of the shaft had a capping, and sometimes carried a figure or animal, such as a griffin, on which is the *superficies*, either a flat disc or tray, or a tazza: in this last case it was perhaps intended for the consumption of perfumes. It may even be suggested that candelabra of such forms were used to support the drapery of screens, as a Corinthian column carrying a vase is shewn so used on a basso rilievo given in MOSES, *A Collection of Antique Vases*, etc., 4to., London, 1814, pl. 63. Other forms, but still portable candelabra, are however found, such as one with a square shaft in the museum at Portici, and another on a basso rilievo in the Libreria di S. Marco at Venice, MOSES, pl. 55. According to PLINY, xxxiv, 6, the best discs were made at Egina, and the best shafts at Tarentum; but CICERO, *Ep. ad Quintum*, fr. iii, 7, indicates that Samos was in repute for the manufacture of such articles. Several capricious forms have been adopted by the ancients as types; thus in a painting at Herculaneum two birds carry the light; a single figure of Silenus seated at the foot of a two-branched plant exists in the *Museo Borbonico*, vii, 15; and a table supported on four claws, and carrying a square shaft ending in four arms, for as many pendant lights, *Mus. Borb.*, iv, 13. This last species of candelabrum, a stand for many lamps, suspended by chains, has been found in several cases at Pompeii and at Herculaneum, whence it appears that the *tychmichus pensilis* of PLINY, xxxiv, 8, was perhaps not a chandelier suspended from the ceiling.

Passing these bronze specimens, which afford useful hints as to the decorative treatment of iron in architecture, we come to the more ponderous and permanently fixed, or not easily moved, candelabra of stone or marble, which, although varying greatly in their shape, present many models of taste in form, proportion, ornament, and execution.

The normal form of this sort of candelabrum is a stone or marble stand shaped like an altar, a brasier, or a tripod, and having a hollow cup at the top, in which the old custom was observed of burning resinous wood or other inflammable materials; these were placed not only within buildings, but in front of an open colonnade, as on a basso rilievo at the villa Borghese: also at the corners of streets, STATIUS, *Syle.*, i, ii, 231, a custom which is still maintained in front of the palaces of the cardinals and ambassadors at Rome; and this use of the candelabrum for incense or for festive illuminations seems to have been the cause of its appearance on the bassi rilievi (antefixæ, etc.) of antique buildings, and perhaps to account for its often carrying a pinccone. This raised hearth was even surmounted by a human figure carrying the torch: HOMER, *Odyssey*, vii, 100-3, and LUCRETIVUS, ii, 24, clearly describe the use of golden figures of youths standing on pedestals in the shape of altars; such figures were generally replaced by a pillar (columnar, or else slightly bulged like a baluster), or by a shaft composed of several pieces, each having a flat top, so that the design could be lengthened or shortened at pleasure. The general features of marble lamp-stands must be collected from the actual specimens

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which remain, such as those found at Velleia, now in the Museo Ducale at Parma: those formed of fragments found in the villa of Hadrian, and placed by Sir R. Newdegate in the Radcliffe library at Oxford, which are engraved with others by PIRANESI, *Vasi, Candelabri*, etc., fol., Rome, 1778: two other candelabra from the villa of Hadrian at Tivoli; and other specimens (in the gallery of the candelabra, etc.), arranged in six compartments in a building added to the museum of the Vatican by Simonetti for pope Pius VI; as well as those in different collections, especially at Paris and Munich. The publication entitled *Antichità di Ercolano*, as well as others above named: with those of VULLIAMY, *Exemples*, fol., London, 1823; and TATHAM, *Etchings*, fol., London, 1799, contain illustrations of some of the finest specimens of antique metal and stone candelabra.

The similarity of purpose will warrant the consideration under this term of the candlesticks, etc., found in Roman Catholic churches, and called *cereum*, *ceroferarium*, *cerozata* (It. *candelliero*), when only having a single light, but *polycandelum* and *polycerium* when having more than one candle or lamp. These are made of wood, brass, bronze, silver, and even of gold, as well as of marble; and their quadrupedality allowed the feet to resemble the four animals seen by the prophet Ezekiel. The most celebrated appear to be those attached to the ambo in S. Clemente, SS. Nereo ed Achilleo, Sta. Maria in Cosmedin, S. Lorenzo fuori le Mura, and Sta. Maria in Trastevere, where they are spiral columns with bands of mosaic work; those of bronze in S. Andrea della Valle, given in LETAROUVILLY, *Rome Moderne*, ii, pl. 194, all at Rome; the silver candlesticks (1680) in the church of S. Antonio at Padua, with the accompanying bronze candelabrum by Andrea Briosco il Riccio, being a cinque-cento adaptation of the antique forms, and given in CICOGNARA, *Storia*, fol., Venice, 1818, ii, pl. 35; another by the artist called Andrea di Brescia by WEBB, *Sketches*, 8vo., London, 1848, p. 286, but Alessandro Bresciano by the *Handbook for Northern Italy*, which is considered inferior only to that at Padua, is in Sta. Maria delle Salute at Venice, and is given by CICOGNARA, ii, pl. 70, together with others in S. Stefano and S. Marco; four others in S. Giorgio Maggiore, also at Venice, are given in the *Illustrations*, pl. 34 (Furniture), which also shows the marble candlestick by Andrea Orgagna in S. Michele at Florence, and two brass ones in the cathedral at Messina; those engraved by GAILHABAUD, *L'Architecture*, etc., from churches at Gaurain, Tournai, Ypres, and Lierre, with two others from Cologne, as well as three Italian ones in the *style de la Renaissance*; that of bronze by Fontana in the Certosa near Pavia; those of silver-gilt at S. Peter's, said to have been designed by Michelagnolo; the four silver standard candlesticks which belonged to the chapel in Whitehall, London, but now in S. Bavon at Ghent; the lectern in a church at Leau, HAGHE, *Sketches*, fol., London, 1840, pl. 18; and, although not executed, the two fine designs by Michelagnolo and Raffaello, engraved by C. Normand. Leading illustrations of old works of this class are to be found in SEROUX D'AGINCOURT, *History*, fol., London, 1847, (Architecture) pl. 13, (Sculpture) pl. 8, (Painting) pl. 16 and 54-56; that at Palermo, in HITTORFF, *Arch. Moderne*, fol., Paris, 1830; SOMMERARD, *Album*, ix, pl. 16; ii, pl. 19, 24; and the *Atlas*, ii, pl. 5, gives more recent specimens: CICOGNARA, *Storia*, pl. 52, 70; CIAMPINI, *Vet. Mon.*, fol., Rome, 1690, i, pl. 37, ii, pl. 15; *De Edif.*, fol., Rome, 1693, pl. 29; WILLEMIN, *Mon. ined.*, i, pl. 13, ii, pl. 100, 282-83; SHAW, *Specimens*, fol., Lond., 1836; and in the *Archæologia*, xiv, 279, xv, 402, xxiii, 322, and xxviii, 442.

The candelabra of Sevres china given by Napoleon to Pius VII; the glass ones made in 1847 for Ibrahim Pacha; the iron lamp-posts of the present time, such as those on the place de la Concorde at Paris, hardly come within the scope of this article.

The ACADEMIE FRANÇAISE, *Dict.*, defines the word 'chandelier' as a support for one or more lights, and 'candelabre' as a large candlestick à l'antique; GUENEBAULT, *Dict.*, draws the distinction that the 'candelabrum' is often suspended, while



the 'chandelier' always stands; being exactly the reverse of the English use of these words. 6. 78. 79. 96.

CANEOPHORA, see CARYATIDE.

CANEPIÑA (FRA MARCO DA), with G. B. Menicucci, designed the front of the church of S. Carlo in the Corso at Rome about 1690.

CANET (ANTONIO) was in 1416 maestro-mayor of the cathedral at Urgel in Spain, and was one of the eleven architects consulted as to the works of the cathedral at Gerona. 66.

CANEVALLI, CANNEVAL, CANNEVALLI, or CHANIVALLE. Several architects of this name are recorded as practising at Prague; Dominic was the court architect when he married in 1683; John Jacob was one of the royal architects when one of his children was christened in 1696; Mark Antony, specially mentioned as an Italian, was engaged in 1682, with Silvestro Carloni (who died 1708 or 1709 at Prague), on the royal collegiate church of Strahow at Prague, and in 1694-6 completed the magnificent cross church at Reichenberg (Bunzlauer Kreis) in Bohemia; a Carlone seems to have completed, 1662, the pediment (Ger. *fronton*) of the parish church of the Hof quarter at Vienna; Carlo Carlone (born 1686 at Scaria near Como, deceased there 1776) with his brother Jacopo (born at Scaria 1675, deceased in 1750) were much employed in Austria as painters and sculptors of decoration; Carlo Carlone built before 1711 the church at S. Florian (Traun Kreis) in Upper Austria; it would therefore be improbable that he should be the Carl Canneval, also called Carlon, who finished 1770 the parish church of the Annunciation, in the Rossau quarter at Vienna; but this last artist was probably the same Canneval who built 1761-77, in imitation of S. Peter's, the cathedral at Waizen. 20. 26.

CANEVARI, CANAVARRO, or CANNEVARI (ANTONIO), born at Rome 1681, built in that city the church delle Stimmate; modernized that of SS. Giovanni e Paolo; made designs (not adopted) in the celebrated competition for the façade of S. Giovanni Laterano, and for the deanery of S. Peter's; went to Portugal, where in 1713 he commenced the aqueduct of ALCANTARA; in 1717 built the large clock tower (CYRILLO, 180) at Lisbon; and made designs (not adopted) for the palace at Mafra; and then established himself at Naples, where he erected 1736 the royal palace built by king Carlo III at Portici, about six miles east of Naples towards Mount Vesuvius; and also erected the Seggio or casa di Porta Nuova, near S. Giuseppe. The notice given by MILIZIA does not appear to be trustworthy. 68. 88. 95.

CANEVARI ( . . . . ) is mentioned under the date 1592-1600 as the designer of the façade and some chapels to the church of S. Paolo at Rome, which was afterwards burnt. 68.

CANGICA, also called ANGICA wood, imported from the Brazils, is of a rosewood character, but of a lighter and more yellow brown, less abrupt, and more fringed, sometimes straight in grain and plain in figure. It is imported in trimmed logs from 6 to 10 ins. in diameter, and is used for cabinet work and turning; HOLTZAPFFEL, *Woods*, 8vo., London, 1843.

CANICE (SAINT) in Ireland, see IRISHTOWN.

CANIS. A pale brown wood of Penang, East Indies, obtained from a very large tree, and used for door frames. 71.

CANNA. A measure of Italy equal to 10 palms. In English feet that of Genoa is 7.300; Naples 6.908; and Rome 7.325 for architecture, but another for trade of 6.5365. The architectural canna of Rome was considered equal to a length of 6 ft. 11 ins. measured by the French *piéd de roi*. 1. 5.

CANNABIC COMPOSITION. The name given to the result of a process patented 5 October 1843 by Mr. Albano, for employing hemp, flax, or cotton, instead of papier maché, etc., as the material for decorations embossed in dies. The stuff is carded, wetted, and rolled into sheets containing about twenty superficial feet, of the requisite thickness. These sheets are saturated with a mixture of manganese, resin, and oil or gas-tar, rolled, dried, saturated with oil and ochre, rolled, stamped with the pattern, dried, coated with a mixture of oil, resin,

turpentine, and ochre, restamped if necessary, dried, and coated with a mixture of animal size and Spanish white.

CANOBBIO (FRANCESCO DA) is mentioned under date 1430-59 as architect to the cathedral at Milan. 27.

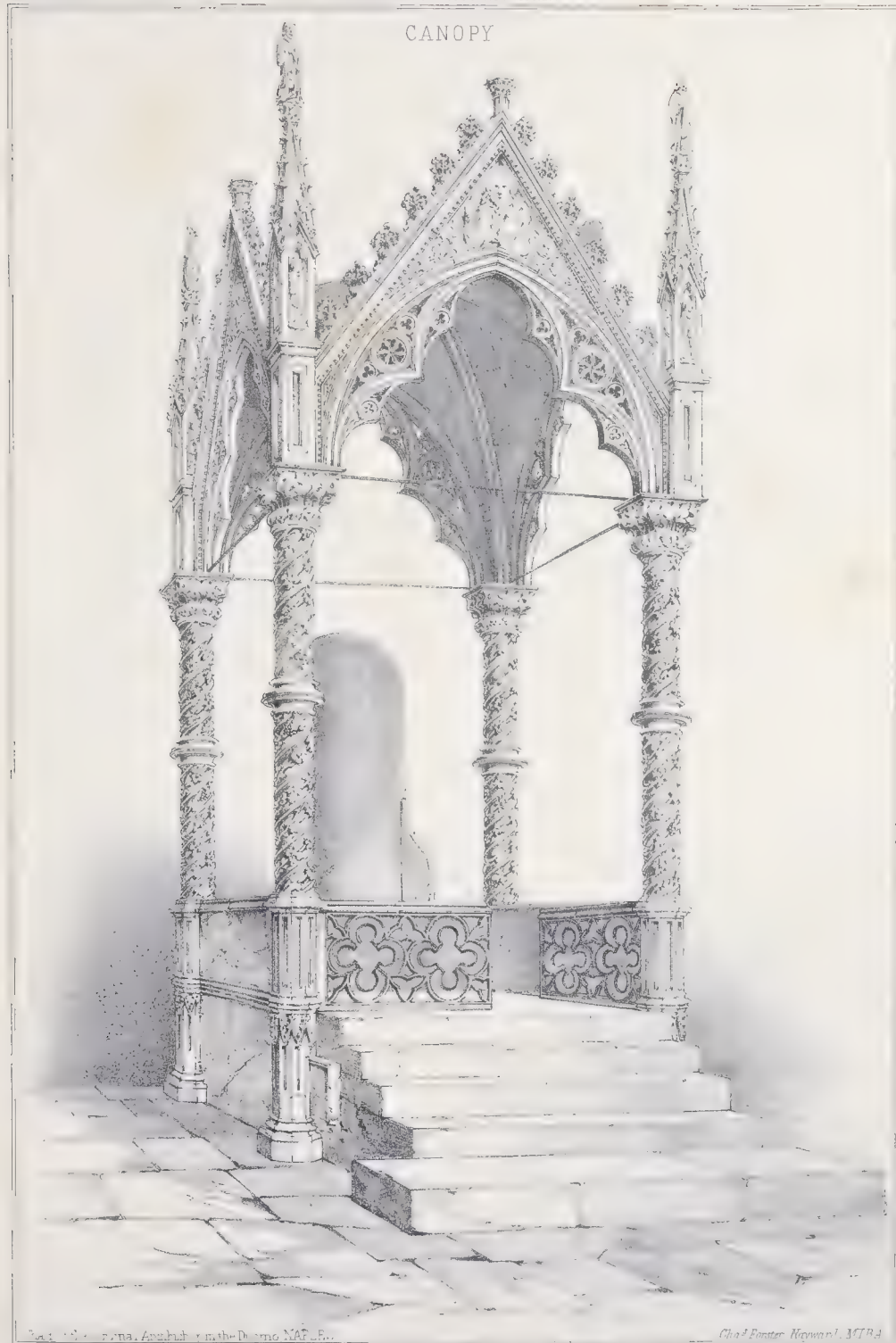
CANONICA (LUIGI), born at Milan 1762, became president of the state council of buildings for Lombardy. He designed in 1805 the anfiteatro Diurno or della porta Vercellina, having an arena about 800 ft. long by 400 ft. wide, which can be flooded, and seats for 30,000 spectators in eight stages, which altogether do not rise more than twenty feet; three theatres, Carcano 1803, Ré 1812, and Fiando; and with Polack, the Filodrammatico; the interior of the palazzo Orsino; and the casa Canonica, all at Milan (the palazzo Bellotti there has been erroneously ascribed to him); and also the theatres at Brescia, Mantua, and Parma, which last was constructed under the superintendence of Bellotti. He died 7 February 1844. 14. 28.

CANONNIÈRE. A French term adopted for a hole left in a retaining wall, in order that water in the earth behind may drain through. 5.

CANOPEUM. A temple to the Egyptian deity Canopus; a building so called existed in the villa of Hadrian at Tibur. 6.

CANOPY or CANAPY. This term is derived from the Latin *conopœum* (Gr. *κωνοπέδιον* or *κωνοπέδιον*), a veil or curtain against gnats, but was applied by late authors to a cloth suspended over a seat. The custom of placing a *state* or *cloth of estate* (It. *baldacchino*; Fr. *voile*, *rideau*, *palle*, *ciel*, *dais*, *pacillon*; for *canapé* means a couch) over the chairs of distinguished persons has introduced the word 'canopy' into the list of architectural terms, to signify a cover over a statue, an altar, a tabernacle, a tomb, a throne, a tribunal, a stall, a pulpit, a doorway, a window opening, or a niche. This cover may be suspended, like the SOUND BOARD of some pulpits, the cover of some fonts, and the BALDAQUIN of many altars in foreign churches: it may be supported upon pillars, like the awning-roof of some verandahs, the covering over many tombs, and the CIBORIUM of an altar: it may assume the appearance of half one side of the length of a complete ceiling, either of masonry or timber, as in the upper portion of many screens; or it may be carried upon brackets or corbels. In this last condition some difference exists as to the precise meaning to be given to the term. GWILT, *Encyc.*, explains it as "the label or projecting roof that surrounds the arches and heads of Gothic niches"; and RICHMAN, *Attempt*, 8vo., Oxford, 1848, p. 52, says "the tablet running round doors and windows is called a dripstone, and if ornamented a canopy": while WILLIS, in a note to the *Glossary*, 8vo., Oxford, 1854, s. v., expresses his belief that "a true canopy is a roof which may be supported upon pillars, or if attached to a wall by one or more sides, must be freed from its surface above as well as below: the term is therefore legitimately applied to the ornamental projections of tabernacle work over the heads of statues; and to the arched head and vaulted coverings of large tombs, when they project completely from the wall . . . or when they stand between pier-arches . . . an arch formed in the thickness of a wall completely receiving the tomb, and having merely an ornamental face, can only be termed a canopy by a license which may perhaps be allowed for convenience sake, inasmuch as a roof is then provided for, but certainly a mere crocketed hood-mold has no claim to be called a canopy." Now this covering, or shade, or hood, is seen in a regular architectural form in the cornice upon consoles of any doorway of classic architecture; in a less decorated state, however, it occurs in every small dwelling where economical protection from the sun and rain is obtained; and in the north of Europe the necessary gabled form has led to some of the most beautiful of mediæval decorations. As soon as the gabled hood was carried on brackets or spurs, as they are called by many writers, especially by RUSKIN, *Stones*, 8vo., London, 1851, i. 191, the first step of their architecturally ornamental character was obtained; and the above named author proceeds to observe that if so large as to require jointed masonry, the gabled side will evidently require

CANOPY



Canopy, Architectural, in the Domain of the Vatican.

Chas. Fowler Hayward, M.P.A.

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Count of Salvo, Barro, over the entrance of S. Pietro Martire, Vercelli

entrance of S. Damiano, Bologna





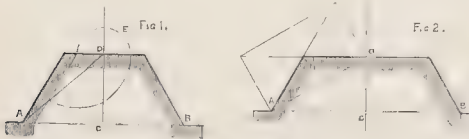
support, and an arch must be thrown across under it. If the projection is gradually cut down, we arrive at the common Gothic dripstone carried on small corbels carved into bosses, heads, or some other ornamental form: the sub-arch in this case being useless, is removed, or coincides with the head of the aperture. **BELL CANOPY.**

Canopies as hoods to window and door heads are more used abroad than in England; it is to be regretted that they are neglected, as even if the classic manner were abandoned, the idea and the introduction of metal-work furnish elements of great picturesque value; and **RUSKIN**, p. 193, correctly observes that the beauty of the balcony protected by a canopy supported by light shafts has scarcely been appreciated; these shafts would serve to confine the ends of blinds, whether lathed or curtained, and thus the advantages of colour would be also obtained.

**CANOSA** (the ancient **CANUSIUM**, **CANUSINTUM**, and **COLONIA AURELIA AUGUSTA PIA**), in the province of Terra di Bari in the kingdom of Naples, was one of the most ancient and important cities of Apulia. **STRABO** mentions the great extent of the walls as attesting the former greatness and prosperity of the city, which the remains still existing confirm: many of these, however, as the aqueduct made by **Herodes Atticus**, the amphitheatre, etc., are of Roman date, as well as a gateway called a triumphal arch, because inscribed with the name of **Terentius Varro**. The hypogea extending three miles are remarkable; one of them, not inferior in interest to any at **Cære** or **Tarquiniæ**, has a portico of four Doric columns, with a range of slender Ionic columns behind them; the walls of the vestibule were painted, while those of the chambers were hung with linen embroidered with gold; the rooms were furnished with marble statues, painted busts in terra cotta, vases, and gilt bronze couches with ivory legs: it is described at length in the **ATHENÆUM Journal**, 1853, p. 142. Many sepulchral monuments and other fragments of the ancient city are worked in the walls of the modern habitations. The collegiate church dedicated to **S. Sabino**, is rich in marbles, and remarkable for a cluster of small cupolas, the ancient pulpit and chair of stone, the granite columns with ancient capitals, and the six immense verd antique columns 18 ft. in height; as well as for the neighbouring dodecagonal white marble tomb of **Bohemond**, who died in 1111, having bronze doors: **HUGHES**, *Travels in Sicily*, 8vo., London, 1830, ii, 487-8; **SWINEBURNE**, *Travels in the Sicilies*, 4to., London, 1783, i, 401. 28. 96.

**CANT**, as a verb, is used by carpenters when they mean to say that they intend to turn a piece of timber that has been given to them with the wrong end foremost. 1.

**CANT**, as a substantive, is used wrongly for an external angle or quoin; it is properly that side of a polygonal body which is neither parallel nor at right angles to the spectator; but long usage has applied the word not only to each face of such a body, but to the whole outline formed by those faces. The accompanying illustrations show the geometrical manner of describing the two most ordinary cants. In fig. 1 the three faces are equal; in fig. 2 half of the centre face is equal to one



of the sides. In each, A, B, C, D, are the only points required to be fixed; the size of the circle, E, may be drawn at pleasure. Solutions of fig. 1 are given in the **BUILDER Journal**, iv, 93, and vi, 336.

**CANTAGALLINA** (**GIOVAN FRANCESCO**), the son of **Giovan Maria**, designed the cathedral (the façade is said to be due to **Inigo Jones**) and the ducal palace, both in the piazza Grande, with "all new civil and military works" at Leghorn: a plan of

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the cathedral is given by **GRANDJEAN** and **FAMIN**, *Architettura Toscana*, fol., Paris, 1815, pl. 106, who confound him with his brothers, **Remigio**, born 1582, ob. 1630, and **Antonio**. He also directed the Spanish works at the fortress of Gaeta, and died 15 Oct. 1656. **BALDINUCCI**, *Vite*, 8vo., Florence, 1844, iv, 142.

**CANTALEVER**, usually written **CANTILEVER**.

**CANTED COLUMN.** A column having its shaft polygonal on plan, as in the lower portion of the columns of the portico of **Philip** at **Delos**, of the columns of the temple to **Hercules** at **Cora**, and of several Egyptian and numerous Indian examples.

**CANTEEN**, from the French word *cantine*. The only authorized place for the sale of liquors in a barrack.

**CANTERBURY.** A city and county of the same name situated on the river **Stour**, in the county of **Kent** in **England**. Portions of the Roman wall remain, as well as some parts of the keep of the castle, which is still 30 ft. high. Of the six gates formerly surrounding the city, **Westgate**, with its fine circular towers, alone remains. The modern city is about four miles in circumference; the streets are well paved and lighted. In **Mercery-lane** are small portions of a building known as **Chaucer's inn**, an upper room occupied by a carpenter still exhibits the old timber roof: two good timber houses also exist in **Stour-street** and in **Palace-street**.

The cathedral or **Christ church** had been several times destroyed by fire prior to the erection of the present structure. Only a few patches of the masonry of **archbishop Lanfranc's church**, 1070-7, remain: the crypt 14 ft. high, the finest in **England**, extending under the entire choir, transepts, **Trinity chapel**, **Becket's crown**, and **S. Anselm's** and **S. Andrew's** chapels, with external walls of other portions, are of the date c. 1096-1110; one of the crypt chapels retains some ancient paintings, and the foliage on some of the later capitals of the columns is remarkable for its close resemblance to the acanthus: the choir, by **William of Sens**, 1175-8: **Trinity chapel**, its crypt and corona by **William the Englishman**, 1179-84: choir wall of enclosure, etc., by prior **Henry de Estria**, 1304-5: screen and monument in **Anselm's chapel**, of **archbishop Mepham**, who died 1333: its window by prior de **Estria**, 1336; given in **BUILDER Journal**, ii: chantry of the **Black Prince**, 1363, and his monument, c. 1376: the nave, aisles (the groins and arches of which are ingenious), west transepts, and chapel of **S. Michael**, c. 1378-1410: chantry chapel and monument of **Henry IV**, c. 1412: new Lady chapel and south-west tower, c. 1449-68: central tower and buttressing arches, c. 1495: the restorations, commenced in 1820, include the rebuilding, 1832-41, of the north-west tower, by **G. Austin**, similar to the **Oxford** or south-west tower: the south porch is given in **BUILDER Journal**, v.

The painted glass in **Trinity chapel** and north aisle is very early, and remarkable for its extreme beauty, several windows have been restored by **Mr. H. G. Austin**, whose father also restored de **Estria's** screen, which was brought to light at the time he removed the altar further back to its original position, and surrounded it with the remains of the jasper pavement, c. 1170, discovered during the same operations: he also erected a new altar-screen, which with his other works, from the year 1820 to 1848, are detailed in the account of his life, s. v. The archiepiscopal chair in the south-east transept is of **Purbeck marble**; the new throne, by **G. Austin**, was erected 1846, **BUILDER Journal**, vi, 139; the west front of the organ screen has very rich detail. The stalls, of the **Corinthian order**, c. 1730, and the stone altar screen to match, were designed by **Sir J. B. Burrough**; the latter, with the oaken choir screen, were removed in 1820. The restorations are continued by **Mr. H. G. Austin**.

The cathedral is a double cross, with a tower 233 ft. 7 ins. high at the intersection of the nave and western transepts, and two towers, each 157 ft. high, at the western end. The principal internal dimensions are—extreme length 514 ft.; choir 189 ft. long, 38 ft. wide, and 71 ft. high; nave 220 ft. 8 ins. long, 72 ft. wide, and 78 ft. 3½ ins. high, including the aisles to



both; the choir transepts 148 ft. 4 ins. long, 31 ft. 5 ins. wide, and 70 ft. 6 ins. high; the transepts are 127 ft. 4 ins. long from north to south, 32 ft. 10 ins. wide, and 78 ft. high.

The building called the baptistery, which formerly contained the reservoir for the supply of water to the monastery, erected by Lanfranc 1084, is 17 ft. in diam. in the lower portion, being octangular above, and has a spiral roof covered with lead. The cloisters, 134 ft. square, date about 1450; more than 800 shields are placed at the intersections of the groined ceilings, "an heraldic assemblage unparalleled in any other church"; WILLIMONT, *Heraldic Notices*, 4to., London, 1827. The chapter house is 92 ft. 2 ins. long, 37 ft. 3 ins. wide, and 60 ft. high inside; the oldest part dates about 1260; repaired 1304; upper part rebuilt fifteenth century; the ceiling, of Spanish chestnut, is very rich. The pavement consists of the slabs in which sepulchral brasses were once placed, these were removed from the nave in 1778; the shafts of the columns in the arcade are of Bethesda marble. Christ church gate, 1517, forms the principal entrance to the cathedral precincts; the green court gate is ascribed to archbishop Lanfranc, c. 1073; and near it are some remains of the domus hospitium. Of the archiepiscopal palace little remains; the last portion, the granary, now forms the residence of Mr. H. G. Austin; the only remnant of the Norman palace consists of his garden wall, in which is a beautiful and unique Norman gateway.

The first Christian establishment of S. Augustine was founded here in 597; the walls enclosed an area of about sixteen acres. In 1844 the site, etc., were sold for £2,100 to Mr. A. J. Beresford Hope, M.P., who presented them for the erection of a college in connexion with the Established Church. The old or 'S. Augustine's' gateway, with its two octagonal towers, begun fifteenth century, were restored in 1845; the chapel, 1846, is built on the foundation of the former one, and is of flint and rubble with Caen stone dressings, total cost about £4,500; this with the dining hall and residences are on the west side of the quadrangle; on the north and east sides is a raised terrace; an enclosed cloister or ambulatory on the north side, 150 ft. long, has dormitories over for forty-five students, each student having an apartment 15 ft. by 8 ft. 6 ins., divided by a partition forming two small rooms. The library, 80 ft. by 40 ft., built over the site of the ancient refectory, has under it a crypt used as a workshop for the students; the whole was completed by Mr. Butterfield in 1847: a view is given in the *BUILDER JOURNAL*, vi, 162; *ILLUSTRATED NEWS*, xiii, 5; COMPANION TO THE ALMANACK, 1849, 234.

There are seventeen churches; that of S. Martin is supposed to be the oldest in England, it was a cathedral church for nearly 300 years prior to the adoption of the present cathedral; it is a small plain oblong building, consisting of nave and chancel without pillars, and a low square tower; it was restored in 1846; the font is presumed Saxon work. Part of S. Mary Magdalene, its font; also S. John the Baptist, are Norman work; that of S. Dunstan, 1322, which has a font cover 4 ft. 10 ins. high, and the Holy Cross, c. 1380, are amongst the earliest.

A new room for the King's school was erected by Mr. H. G. Austin, 1854, over the old Norman arches of the refectory, with which it corresponds in design (the external Norman staircase, the finest example remaining, 6 ft. wide, is also connected with it); it cost about £1,000; *BUILDER JOURNAL*, xii, 278; RICKMAN, *Attempt*, etc., 8vo., London, 1848, 69-84; TURNER, *Domestic Arch.*, 8vo., London, 1855, p. 7; S. Mildred's schools, by Mr. J. Messenger, 1855, of flint with Bath stone dressings; *BUILDER JOURNAL*, xiii, 146: the clergy orphan schools for 200, but at present only 120; each boy has a separate bedroom, the divisions being 7 ft. in height; it was erected 1855 by Mr. P. C. Hardwick, in Kentish rag and Caen stone, and cost £15,000; *BUILDER JOURNAL*, xiii, 162.

The chief public buildings, which are of no great architectural importance, comprise the guildhall, rebuilt 1688, the south end 1697; the sessions house; the county and city

gaols; the workhouse; the house of correction; the theatre; the assembly rooms; the railway station; the Philosophical and Literary Institution; and the union workhouse, erected 1848 by Mr. Parker, assistant commissioner, which is similar to that at Aylesbury; *ILLUSTRATED NEWS*, ix, 304. The corn market (*ILLUSTRATED NEWS*, viii, 109), erected 1824, has the vegetable market under it; two other markets; the cavalry barracks, 1794, for 800 men, costing £40,000; the infantry barracks, 1798, for 2,000 men; the military infirmary; Jesus hospital, 1593; Kent and Canterbury hospital, 1798; Cogan's or Cokyn's hospital, 1657; East-bridge or King's-bridge hospital; S. John's hospital, 1084, lately rebuilt in Kentish rag and Caen facings by the present prior, Mr. George Austin, who has also rebuilt the almshouses of S. Nicholas' hospital at Harbledown near Canterbury, the chapel of which is supposed to remain as erected about 1084, when founded by archbishop Lanfranc—these comprise the other public erections of this city, the seat of the see of the metropolitan of all England. In 1790 the ramparts and adjoining gardens called the Dane John grounds were purchased, and a terrace formed 1840 ft. long and 12 ft. wide.

H. G. A.

SOMNER, *Antiq. of Canterbury*, 1640, 2nd edit. by N. Batteley, 1703; GOSLING, *A Walk*, etc., 3rd edit., 8vo., Cant., 1779; DART, *Hist.*, etc., of the Cathedral, fol., London, 1726; WILD, *Twelve Perspective Views*, fol., London, 1807; WOOLNOTH, *A Graphical Illustration*, etc., 4to., London, 1816; BRITTON, *Hist.*, etc., 4to., London, 1821; BUCKLER, *Views of Cathedrals*, 4to., London, 1822; WINKLE, *English Cathedrals*, 8vo., London, 1836-42, i; STOREY, *Cathedral Churches*, 8vo., London, 1814-9; WILLIS, *Arch. History*, 8vo., London, 1845, which gives GERVAISE's account of the burning and rebuilding of the cathedral; SUMMERLY, *Handbook*, 8vo., Cant., 1843; GROSE, *Antiq.*, 4to., London, 1785. A plan of the monastery, compiled in the twelfth century, is given in the *VETUSTA MONUMENTA*.

CANTERBURY (ARCHBISHOP BALDWIN OF) between the years 1184-91 built a church and monastery at Heckington near Canterbury, which he afterwards pulled down. 1. 2.

CANTERBURY (JOHN), born at Tewksbury, was clerk of the works at the commencement of the chapel of King's college, Cambridge, of which college he was a fellow, in 1451; DALLAWAY, edition of WALPOLE's *VERTUE's Anecdotes*, 8vo., London, 1826, i, 178.

CANTERBURY (MICHAEL OF), *cementarius*, received in 1291-93 the sum of £226:13:4, as payment of charges in respect of the erection of the cross in Westcheap, London, which was the handsomest, except that at Charing, of all that were erected to the memory of queen Eleanor; HUNTER, in *Archæologia*, xxix, 184: his name also appears, 1292, in the roll of expenses, etc., relative to the foundation of the King's chapel in the palace at Westminster (S. Stephen's chapel was apparently erected by him); BRITTON and BRAYLEY, *History*, etc., 8vo., London, 1835, p. 424.

CANTERBURY (THOMAS OF) appears in the accounts of Walter de Weston, clerk of the works at the king's palace of Westminster, etc., in 1330, May 27, as then coming first and beginning upon the new chapel of S. Stephen, and working an *intramura super moldis* at the payment of one shilling per day for at least nine weeks; BRITTON and BRAYLEY, *History*, etc., 8vo., London, 1835, p. 150.

CANTHARUS. The name of a peculiarly shaped drinking vessel particularly consecrated to the personifications of Bacchus; MACROBIUS, *Sat.*, v, 21. The word was afterwards applied to the part or apparatus of a fountain from which the water issued; and was finally given to the basin, also called *labrum* and *nymphæum*, placed in the middle of the atrium before a basilican church, that the members of the congregation might perform ablution before entering the church. MACRAUS, *Hieroglyphicon*, fol., Venice, 1735, p. 117, explains this term as "a suspended lamp". 2.

CANTHERIUS or CANTERIUS. The Latin term used by VITRUVIUS, iv, 2 and 3, for the principal rafter (Fr. *force*) in a wooden roof, the end of which rafter is supposed to be represented by the mutule of the Doric order.

1. 2.

CANT-HOOK. A piece of iron formed with a hook at one extremity, so as to bite a log, when a lever, passed through a ring at the other end of the iron, is used to turn over or *cant* the balk or log.

CANTILEVER or CANTALEVER. A bracket that projects many times its breadth, and at least more than twice its depth, made of wood, stone, or metal, and projecting from the surface of a wall to support the eaves of a house, a balcony landing, or the corona of a cornice, etc.

CANTLING. The name given to the lower of two courses of burnt bricks which are placed on the top of a clamp before fire is applied. BRICKMAKING, p. 139.

CANTON (Chinese, *Kwangchau-fou* or *Sing-ching*). A city, in the province of Kuangtung, the fourth in size in China and the oldest in the southern part of that country. It is situated on the river *Chou-kiang* or Tigris (which is at that part about as wide as the Thames at Wapping), and extends nearly four miles along the left bank. The city proper, surrounded by a wall six miles in circumference, is of a square form and divided into two unequal parts by a wall running from east to west; including the suburbs it is about ten miles in circumference. Large portions have been since 1835 destroyed by fire. The walls are from 25 to 40 ft. high and from 20 to 25 feet thick, formed of a coarse red sandstone with blue brickwork, and have twelve outer and four inner gates. The streets of the suburban town are short, nearly straight, intersecting each other at right angles, and are about 8 ft. in breadth, varying perhaps between 6 to 16 ft.; they are all paved with rude granite slabs. At the entrance to some streets are gateways consisting of plain jambs and lintel of granite; above this is a moderate height of brickwork, then a coping of the expressive tiles and their thick rolls, ridged with fantastic plaster fretwork coloured red, black and white; the doors to them are far from substantial. Canals on which boats pass run up from the river to the interior of the city; where a street occurs the canal is covered over by an arch ascended on each side by a flight of about twelve steps. The houses of the poorer class are built of unbaked clay or mud, and are small and low, rarely exceeding one story in height. Those of a better class are of brick, with wood framework in the upper part, or of the latter only, and stand close upon the street: others again are within a court enclosed with brick walls about 12 ft. high, in which are small openings of various shapes, with a common palisade gate on a flight of rude granite steps, as may be seen along the water frontages. The side of the house shows two low pitched gables of brick, sometimes having square glass windows with cornices and pediments of stucco; the upper floor in front and back is divided into bays either by brick piers or round posts, the spaces between being filled in, the lower part with 'stall boarding' about 3 ft. high; small casements of figured oyster-shells set in green sashes, of chance shapes, close up the front. The casements have their plaster styles pivoted into the head and transom, or to pieces fixed on them, and flap about in windy weather independent of jambs and muntins. The usual carved eaves board is curved up at the ends.

The shops contiguous to the *Shap sarm hong*, the thirteen trading houses of foreigners, are generally two stories in height without sashes in front. The superior class have sometimes only a lofty story, richly decorated with screens and shutters of carved fretwork and foliage, as shown in p. 6 of *Detached Essay*, CHINESE ARCHITECTURE: this work is gilt and japanned or varnished green. The counters are often of marble in large slabs, and stools having sometimes marble seats are placed about them. The upper story is ascended by a neat winding compact angle staircase. The front room has carved casements or green Venetian blinds over a light wooden boarded balustrade, forming the front to the street. A slight step ladder and outward

ARCH. PUB. SOC.

trap leads up to the flat roof used for drying clothes, and storing lumber. At the end of the party wall of two shops gaudily-painted signboards are hung from the wood-post division which sometimes extends from base to eaves in one length, sometimes one pole on another, as illustrated in the coloured plates 3, 4, and 5, CHINESE ARCHITECTURE; and in WRIGHT, *China*, 4to., London, 1843-9, ii, p. 62; iii, 48; the *dwelling* in coloured plate 2, and in pl. 1; also in WRIGHT, i, 95; ii, 12, 54.

The foreign factories or *hongs* extend for about 800 ft. along the shore and are comparatively very showy, consisting of two or three stories high, built of brick over granite foundations, and exhibit stucco imitations of the Doric and Corinthian columns. Several were destroyed by a fire in 1844.

The public buildings are numerous but do not deserve special notice; a prison is said to contain one thousand persons: nor are the military buildings imposing; a granite wall from 12 to 20 ft. high encloses either a quadrangular, oval, or circular area, within which trees and temples are introduced if possible. The embrasures have granite lintels and are a few feet from the crest of the wall, which is sometimes embattled. The entrance is surmounted with a simple gatehouse without machicolations. The temples either facing the river or ranking with the houses, are very simple. Side walls projecting from the main building form, with two pillars of wood or stone about 12 ft. high, a portico 'in antis,' palisading and a gate coloured red, placed in the openings, and a red figured eaves-board finish the front; illustrated in coloured plate 3. A doorway of granite work square and simple leads into the interior. Perhaps a lobby may be formed within the doorway by a screen of red columns and boarding, with side accesses to the *cella*. Having no windows the roofs are formed so that a central square covering may be raised 4 or 5 ft. above the four lean-tos against the outer walls, with antefixa at the eaves, and eave boards carved and painted red: the rain-water is brought down in pipes of pottery, stuccoed in imitation of bamboo and placed against any convenient column. The inside of the tiles is left plain, the battens painted blue, the purlin poles red, and sometimes inlaid with mother of pearl. The pillars supporting the square roof are four in number, with flat faces rounded on each return, which also support the lower roofs. Within is a model of a pagoda or temple well carved, a flowering shrub or two, and a great metal vase containing a wood fire; beyond is a palisading enclosing a dark sanctum, having tables on which are placed pewter vessels, tinseled flower pieces and other ornaments. A row of male and female gods are placed against the side walls, and two or three men and women may be seen burning paper sacrifices in small brick ovens built as altars. Some temples have no gods, or only one or two insignificant images.

There are two pagodas; one, called *Kwang-tah*, or plain pagoda, tapers to a height of 160 ft., and is about ten centuries old; the other is octangular, of nine stories, 170 ft. high, and thirteen centuries old. Some others in the neighbourhood are described in p. 11 of *Detached Essay*.

A plan of the city is given in the maps of the Society for the Diffusion of Useful Knowledge, No. 170a; in the Royal library of the Brit. Mus. is a carefully executed distemper drawing of the river frontage, 28 ft. in length; BURFORD, *Descr. of Canton*, 8vo., London, 1838; MURRAY, *Hist. and Account of China*, 3rd edit., 3 vols., 8vo., Edinburgh, 1843; FULLARTON, *Gazetteer of the World*, 8vo., Edinburgh, 1850.

E. A.

CANTONE (GIUSEPPE), of Forlì, is said to have been the architect of the amphitheatre or *Arena* at Mantua, which was finished in 1821.

68.

CANTONE (PIETRO FRANCESCO), with Giovanni Angiolo Falcone, designed the palazzo Marcello Durazzo in the Strada Balbi at Genoa. GAUTHIER, *Gènes*, fol., Paris, 1856, i, pl. 15.

CANTONE (SIMONE), born at Mazzio, was a pupil of his father, Pietro, who was much employed in Genoa. The son studied also at Rome and settled at Milan, where he erected



the palazzi Mellerio and Serbelloni, 1794, with the casa Perticati: he also built the *seminario* and *liceo* at Como, the villa Raimondi near that town, the palazzo Valletti at Bergamo, with a church at Gorgonzola, and in 1778 was commissioned to reconstruct after a fire the façade, the great hall on the first floor, and the roof of the *palazzo ducale* at Genoa: according to MILIZIA, in v. Rocco Pennone, who adds that the drawings for this work had been published. He also restored the villa Brignola at Voltri; GAUTHIER, *Gênes*, fol., Paris, 1856, i, pl. 6; ii, pl. 46. He died 3rd March, 1818. WIEBEKING erroneously attributes to him the *arena* at Mantua; and some writers state that CARLONE executed the palazzo ducale. 14. 99.

CANTONED. When a building is decorated at the angles with colums, pilasters, rusticated quoins, or anything of a similar kind projecting before the general face of the work, the structure is said in the French language to be *cantonée*; and the word has been adopted in English architecture for a pier as well as for a building. 1. 2.

CANTORIA. This term is applied to two sorts of tribunes or pulpits placed, one in the choir and the other in the nave, in the cathedral at Ferrara; the largest belonging to the chanters, and the other to their superiors: FRIZZI, *Memorie*, 4to., Ferrara, 1790, ii, pl. 7 and 17.

CANUSIUM. The Latin name of CANOSA in Apulia.

CAOUTCHOUC, or GUM ELASTIC, called INDIAN RUBBER from its use in removing from paper the marks of black lead, which is mentioned as a novelty in the preface to PRIESTLY, *Perspective*, 8vo., London, 1770, was introduced into Europe about the beginning of the last century from the East Indies. Its origin seems to have been unknown until de la Condamine in 1735 ascertained in South America that it was procured from a tree called *Hvé*. It is the result of evaporating a yellowish white juice, obtained by tapping various plants, especially the *ficus elastica* of Asia, and the *siphonia elastica* of Brazil, which chiefly supplies the European market. Atmospheric air solidifies as well as darkens this juice; heat, alcohol, and acids, alike coagulate it and separate the caoutchouc; which when exposed to the air in thin sheets dries quickly, losing from a third to a half in weight: that which is made into sheets about 2 ft. long by 1 ft. wide, and half an inch thick, is esteemed the purest. It should be tasteless, scentless, white, extremely elastic, inflammable, unalterable by exposure to the air except as regards its being more or less rigid according to the temperature, insoluble in water and in alcohol, soluble in ether and in essential oils, acted upon by alkalies, and decomposed by concentrated sulphuric and nitric acids. The constituent elements seem to be about eight atoms of carbon to six of hydrogen; but it contains also nitrogen, as ammonia is evolved during the combustion of that received in Europe. Though insoluble in water, if strips are wound around a rod so that the edges touch each other, and the whole be boiled, the edges will soften and adhere, so that the rod may be withdrawn leaving a tube: after solution in ether, the caoutchouc may be found unchanged upon evaporation: after solution in the essential oils, it remains glutinous upon evaporation; but if ether be mixed with a solution in cajeput oil, the caoutchouc is separated in a semifluid state, and regains its consistency and elasticity: and naphtha or petroleum dissolves it, leaving it unchanged upon evaporation. Caoutchouc when highly heated fuses, and retains the consistency of tar when cool; when distilled it affords the lightest fluid and the heaviest gas that are known. In the *Civil Engineer Journal*, vii, 428, there is however a statement that "M. Chevreul has shown that linseed oil placed on the external surface of caoutchouc renders it impermeable to gas." Besides its well known use for waterproofing, it has been used for speaking-tubes, gas-pipes, tarpaulins, flooring (KAMPULCON), and in solution, as at Antwerp, for covering the copper sheeting of a spire.

The process of *vulcanization* is the incorporation of sulphur with the caoutchouc by heat under steam pressure; the union

is only temporary, but the operation has been improved and the sulphur is retained in the caoutchouc by the addition of lead, which forms a basic salt (sulphuret of lead). The caoutchouc undergoes no change except that it resists the action of gas, acids, and alkalis, and that it preserves an uniform density in all temperatures, whence it is fitted to be a conduit for very hot fluids of any kind, and for springs, bands, and similar articles for the purposes of mechanism, as manufactured at Mitcham by Messrs. Hooper and Fry. *URE*, *Dict.* s. v., 4th edit., 1853.

MINERAL CAOUTCHOUC is a term sometimes but improperly applied to the elastic varieties of petroleum. 14.

CAP or CAPPING. An abbreviation of CAPITAL. The term was used for a coping during part of the eighteenth century, common houses of that period having their front and back walls "capped with large deal yellow boards of two or three inches thick and painted like stone capping, and divided like the joints of the stone; CAUTY, *Natura*, 8vo., London, 1772, p. 40. The word CAP is also applied to a cornice in a Greek or Italian style placed over a door or a window. CANOPY.

CAP. The name given to the upper stratum of the stone quarries in the Isle of Portland.

CAPACCIO NUOVO. A city in the province of Principato Citra in the kingdom of Naples. Although the seat of a bishopric, and possessing a cathedral recently built, two handsome churches, and a monastery, the episcopal duties are partly performed at the older cathedral, dedicated to Sta. Maria Assunta della Granata, situated at a distance of two miles, in Capaccio Vecchio, which marks the site of a town destroyed in the thirteenth century. 50. 96.

CAPEDO or CAPIS. A vase like an ewer, found sculptured upon friezes showing the various implements employed by the Romans at their sacrifices. CICERO, *Parad.*, i, 2. FESTUS, s. v.

CAPE HAYTIEN. A seaport city in the island of Hayti. It was while under the French dominion a handsome town, but though the houses were built of stone, the wide and well paved streets are half marked by ruins. The squares and markets are large, and having fountains yielding an abundant supply of good water. The cathedral, rebuilt by subscription, and the noble military hospital, lately restored, are the two chief edifices. 50.

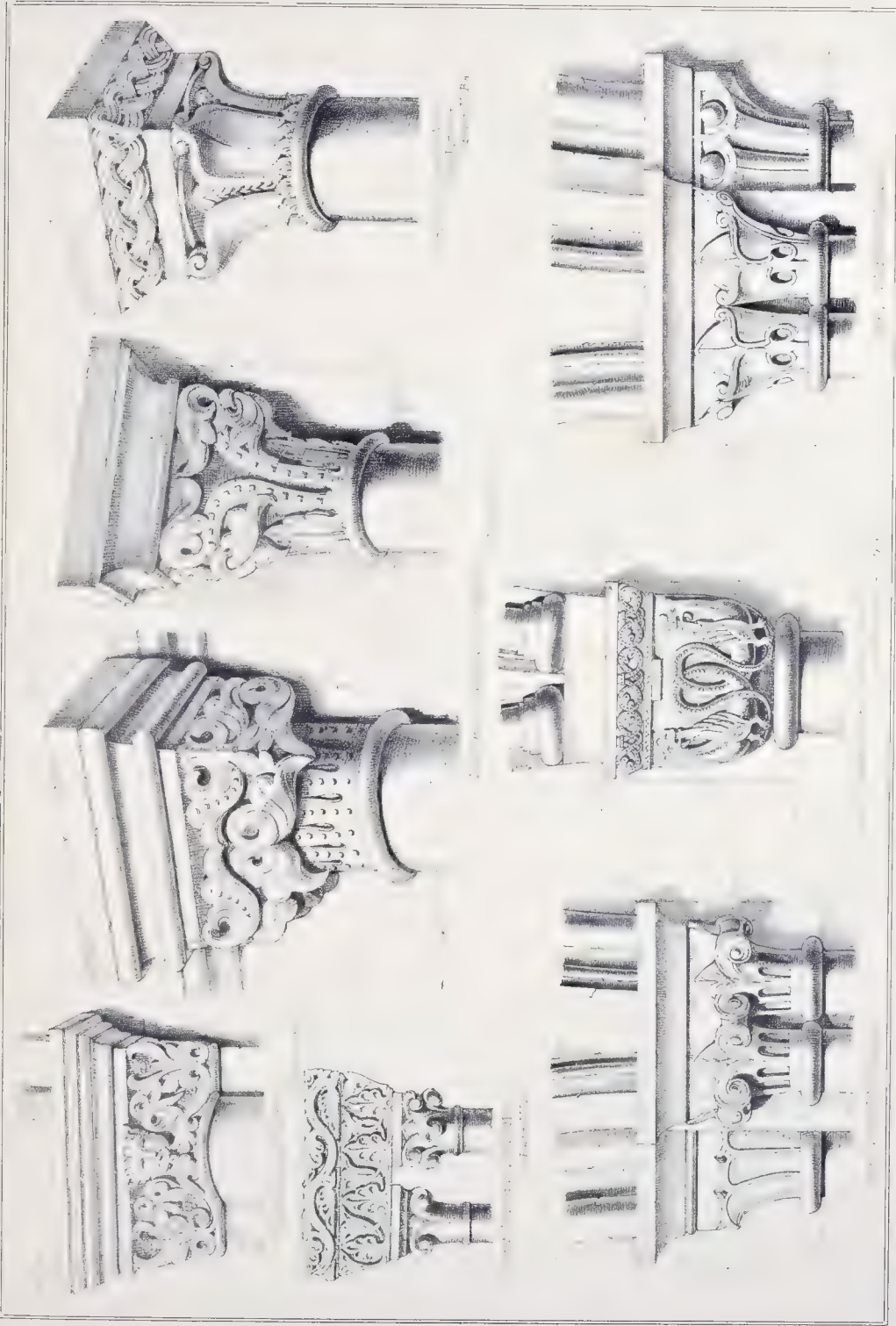
CAPITAL (*It. capitello*; *Sp. chapitel*; *Fr. chapiteau*; *Ger. Kapitäl*). The head or uppermost member of any part of a building. It is applied in a restricted sense to the upper complete portion of a column, a pilaster, a pier, and a baluster. Illustrations of capitals used in Chinese, Indian, Persepolitan, and Egyptian architecture, are to be sought chiefly in the works of CHAMBERS, FERGUSSON, and FLANDIN, and in the *Description de l'Egypte* respectively; MAUCH, TEXTIER, NORMAND, LETAOUILLY, BLONDEL, and CHAMBERS, furnish specimens used in Greek, Roman, and Italian works; SALZENBERG, D'AGINCOURT, MÜLLER, PUTTRICH, HEIDELOFF, VIOLET LE DUC *Dict.*, s. v. *Chapiteau*, and the *Voyages Pittoresques*, supply specimens of continental Byzantine, Romanesque, and Mediæval capitals; RICKMAN, SHARPE, and PALEY, with the *Cathedrals*, must be consulted for examples of the capitals belonging to pointed architecture in England; and OWEN JONES for those belonging to Arabian art. ANGLE and ANGULAR CAPITAL.

CAPITAL OF A LANTERN. The covering which terminates the lantern of a dome; either in the shape of a bell as at the Sorbonne in Paris, or of a spire as at the church della Sapienza in Rome, or of a cupola as at the Redentore at Venice. 1. 2.

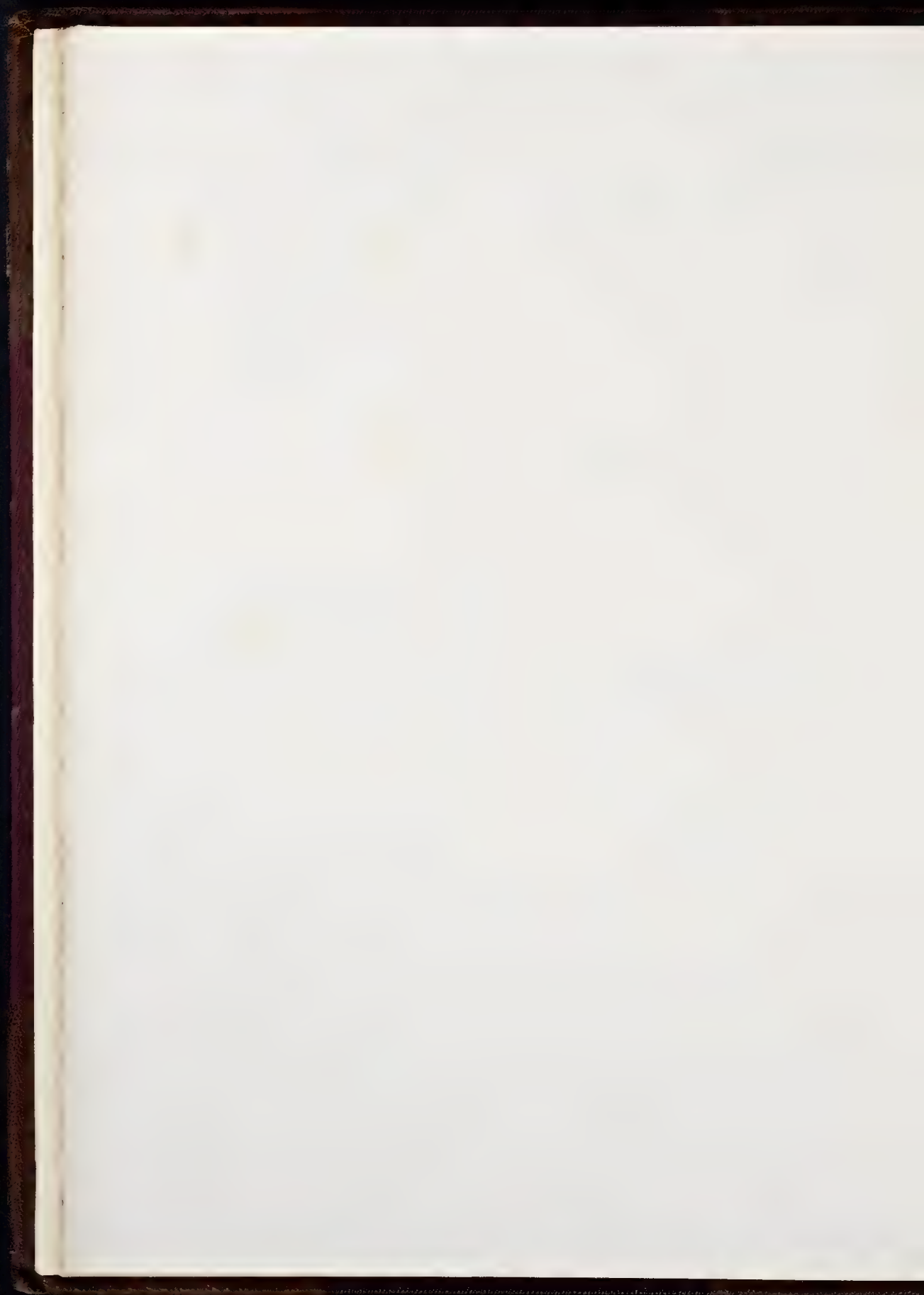
CAPITAL, OF AN ANTA OR PILASTER, see ANTA and PILASTER; OF A PIER OR PILLAR, see PILLAR.

CAPITAL OF A TRIGLYPH, called TÆNIA by Vitruvius. The square band above and projecting before the vertical face. In most Greek examples it projects before the face but not before that of the return; in most Roman examples it has a greater projection than in Greek architecture, and its return projects over the sides as much as its face overhangs. 1. 2.

CAPITANEA. The term used in the Rustic edict, or rather code, of Charlemagne for the larger, and *mansionalis* for the





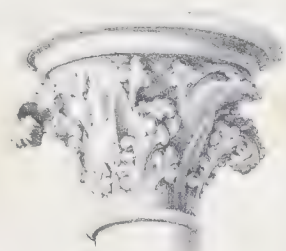




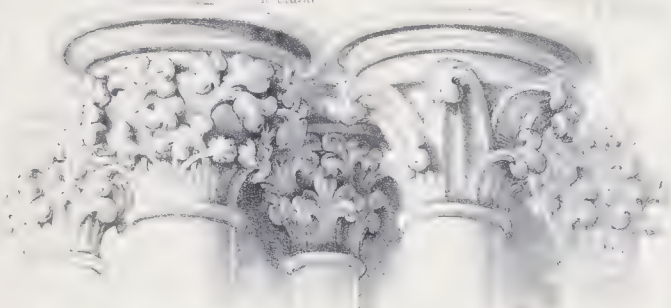
Cathedral, ELY  
F. P. Cockerell



Cathedral AMIENS  
H. Clarke



Arena Arezzo



Jubilee Porch, Cathedral ELY  
F. P. Cockerell



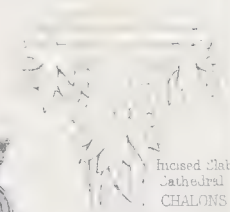
Cathedral, CHALONS  
H. H. Newton M.B.A.



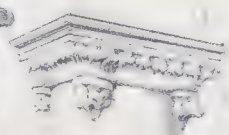
Cathedral PALERMO  
(East Door)  
H. H. Newton M.B.A.



Shrine in Or San Michele, FLORENCE  
J. M. Lockart Junr M.B.A.



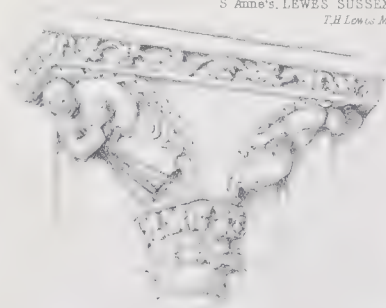
Incised Slab  
Cathedral  
CHALONS  
S. Salter-Lane



S. Anne's, LEWES SUSSEX  
T. B. Lewis M.B.A.



H. Dunlop

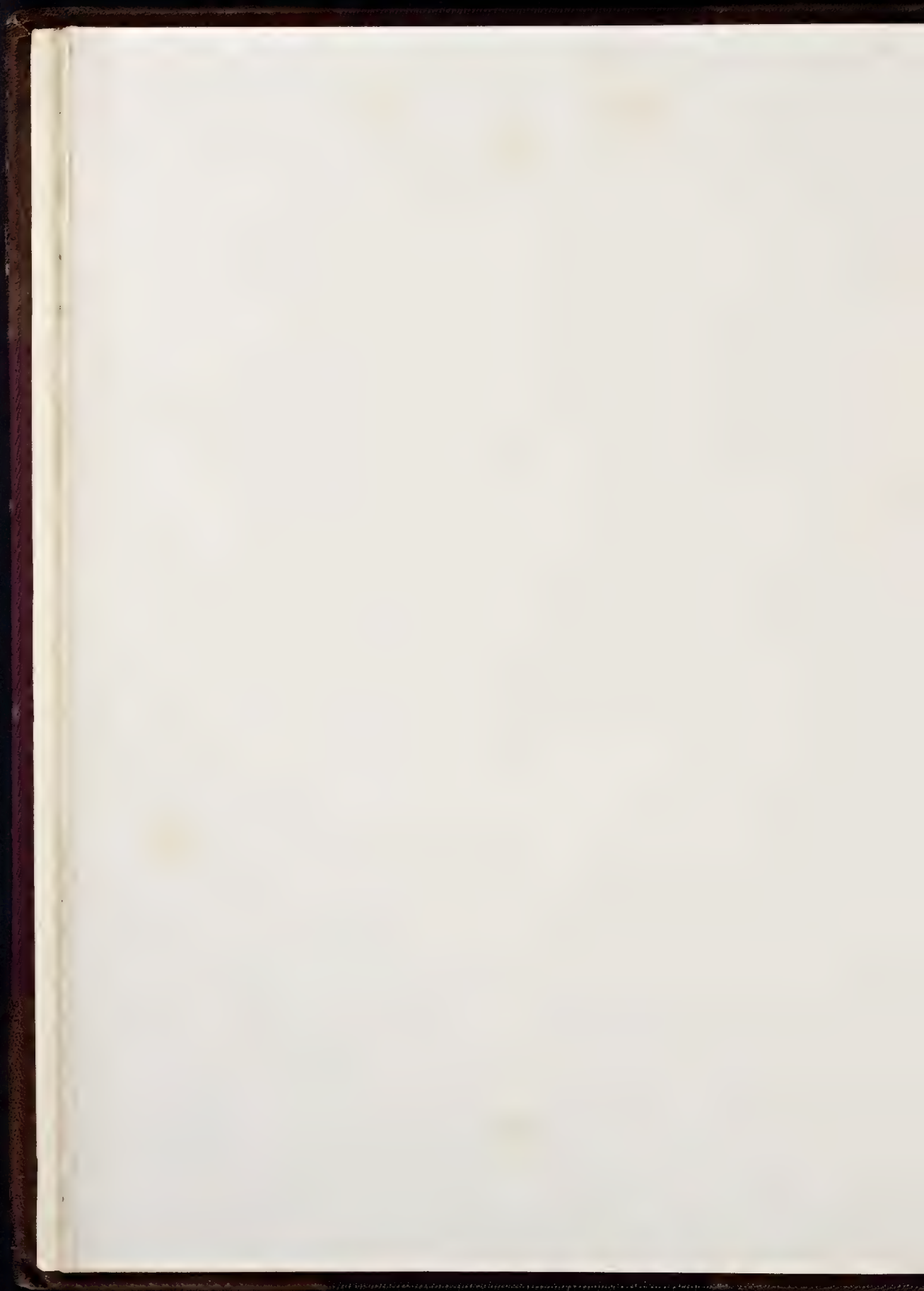


















smaller, villas of the royal domains. GIBBON, *Decline and Fall*, xxxviii.

**CAPITOL.** The name given in the United States of North America not only to the palace of the Federal Legislature at Washington, but to the edifice, usually called State House, erected for the accommodation of the legislative bodies of each State, such as that at Columbus for Ohio, etc.

**CAPITOLIUM.** The name originally given to the site of the temple to Jupiter Optimus Maximus at Rome, commenced by Tarquinius Priscus, upon the hill at first called Mons Saturnius, afterwards Tarpeius, and at last, as now, Capitoline (LIVY, ii, 10; vi, 20. Afterwards capitolum meant not only this temple, but included the adjacent citadel (TACITUS, iii, 71), and the buildings within its precincts. By degrees the whole hill assumed the name of Arx, and also of Capitolium, whence the many other buildings specified by ALEXANDER AB ALEXANDRO, *Geniales Dies*, 8vo., Leyden, 1673, vi, 11, are described as in the Capitol. The exact position of the temple, citadel, and those other buildings, is elaborately discussed by SMITH, *Diet. of Ancient Geography*, 8vo., London, 1852, s. v. Roma, p. 761-9.

BURGESS, *Topography*, 8vo., London, 1831, i, 434, states that the modern Campidoglio is built upon the vast substructions of an ancient edifice, which in a more general acceptation of the term was also called the Capitolium—this remarkable ruin, all that can be said to remain of the ancient works of the Capitol, was the *tabularium*—that is the place where the “*tabulae*” or plates were preserved on which were engraven the decrees of the senate and people, and all other public proclamations: it was very probably also the public *atrium*, for such an object is mentioned as in LIVY, xxiv, 10: we read also of a library which with great propriety might be deposited in the upper stories. HOFMANN, *Lexicon*, fol., Basle, 1677, s. v., gives a list of the Roman colonial cities, which had Capitols; among them Toulouse, where the name is still retained by a comparatively modern building, illustrated by NODIER and TAYLOR, *Voy. Pitt.* (Languedoc), i, pt. 1, pl. 21-25.

When at Rome Capitolium ceased to be the title of the citadel and temple, it was retained as the name of the offices of the civil magistracy, which at present, under the corrupted name of *Campidoglio*, chiefly consist of three buildings forming as many sides of a piazza, planned with the accessories by M. A. Buonarroti: the north-west side is open to the city, and the south-east contains the palace of the senator, having on one side the palace dei Conservatori, and on the other the Capitoline museum. These occupy the *intermontium* or space between the two summits of the hill, access to which is obtained by steps leading up to archways of uniform design (illustrated by LETAROUILLY, *Rome Moderne*, fol., Paris, 1849, pl. 4): this modern Capitol was engraved 1649 in ten very rare plates by Charles Buyrette, a pupil of Carlo Fontana.

Finally the word CAPITOLIUM was applied to the chapter and to the chapter-house of a monastery.

**CAPO D'ISTRIA.** A seaport city in the province of Illyria in Austrian Italy. It is situated on an island connected with the main land by a causeway half a mile long, and chiefly consists of narrow and dark streets of ruinous houses. The cathedral, dedicated to Sta. Maria Assunta and S. Nazario, a lofty but sombre modern building faced with marble after the Venetian manner; several churches, especially that of Sta. Anna; two monasteries and a nunnery; the *kicoo* and the *ginnasio*; the town hall, in a Pointed style; the theatre; and the granary, are the chief public buildings. 20. 50. 96.

**CAPILLARITY.** When a solid body presenting interstices of small dimensions or minute tubes is inserted in a liquid, it will be found that a change takes place in the level of the surface of the liquid. The law upon which this phenomenon depends has been designated by the term “capillarity” or “capillary action.”

In some liquids, such as water, the level in the interior of the capillary tubes will be found to be higher than that on the

ARCH. PUB. SOC.

exterior; whilst in others, as in mercury, the inner surface will be depressed; and again, when such bodies as polished steel are immersed in a liquid, no difference of level will be observed. Capillary attraction exists between plates, separated by very small intervals, or in cones, triangles, or other forms, equally with cylindrical tubes, but it is more powerful in the latter than in any others. It does not vary when the observations are made *in vacuo* from the results obtained in the open air; and the thickness of the solid bodies producing the action has no effect upon its extent or mode of manifestation. In tubes the fluid rises or falls in the interior in the inverse ratio of the diameter, that is to say, it rises or falls the most in the smallest tubes; whilst between plates it falls or rises the more in proportion as the plates approach one another. In prismatic tubes the elevation or depression is in the inverse ratio of the perimeter of the section perpendicular to the axis; in cylindrical tubes it is in the inverse ratio of the diameters; and in the case of cylindrical tubes the difference of level is generally speaking about double that observable between plates separated by a space equal to the inner diameter. The surface of the liquid in all these cases is evidently semicircular, the axis being horizontal and the diameter equal to the distance between the two films, in the case of plates separated by small intervals; it is hemispherical in capillary tubes, the radius of the sphere being equal to half the interior diameter. For the same liquids it appears that the range of differences of level varies in proportion to the densities, and these last are known to depend greatly upon the temperature. It is supposed by some writers upon physics that the extraordinary action known under the name of ENDOSMOSIS is a modification of capillarity. DUTROCHET, *De l'Agent immédiat du Mouvement Vital*; POISSON, *Nouvelle Théorie de l'Action Capillaire*; JAMESON, *Mechanics of Fluids*.

The influence of capillary action upon building materials is a subject of great importance, which has not hitherto been examined with the attention it merits. In the article BRICKWORK, p. 147, it is stated that walls decay the most rapidly about the zone where capillarity ceases; for the efflorescence of the salts, which remove the particles of the materials composing the walls, takes place in those portions which are occasionally exposed to take up moisture from the ground or from any surrounding medium, in a far more decided manner than it does in the portions constantly saturated. The minute pores of stones or of bricks, and the long fibres of woods, act as tubes in which capillarity will cause any moisture derivable from external sources to rise to heights varying with the dimensions of the tubes, and practically with the degree of saturation of the source of moisture. It is just below this extreme height that disintegration takes place most seriously. Hitherto no observations have been made to ascertain its precise limits for any of the materials in use, but it may generally be stated to be higher in the sandstones, the oolites, and the magnesian limestones than in the sub-crystalline marbles or limestones, whilst in granites the capillary action can hardly be said to exist. The general capacity of a stone to absorb water may be taken to represent what may be called the energy of the capillary action in it; nevertheless it has been observed that in some descriptions of sandstone the tendency to decay does not bear any relation to the capacity for taking up water by capillarity. This agent, in fact, is only deleterious when the chemical ingredients of the stones are able to form new salts in consequence of the presence of the water. ATMOSPHERIC INFLUENCE. CAEN STONE. G. R. B.

CAP OF A PEDESTAL, see SURBASE.

**CAPORALI.** The family name of several architects at Perugia, who have been confused by VASARI and his followers. BARTOLOMEO died after 1499: one of his sons, GIAMBATTISTA, called IL BATTI by contraction, is the BENEDETTO sometimes mentioned; he was born in 1476; was a pupil of his father, as well as of Pietro Pierugino; published a commentary and translation of the first five books of *Vitruvius*, fol., Perugia, 1536; built for the cardinal Silvio Passerini (ob. 1529) the



palazzo Fontecomeli, afterwards called il palazzone, about half a mile from Cortona; was probably employed at Milan, and at the Certosa of Pavia; and was the master of Galeazzo Alessi; he died about 1553 or 1560: his son GIULIO, also an architect, was born about 1510, and died after 1582. MARIOTTI, *Littere*, Svo., Perugia, 1788. 30. 42.

CAPPAGH or CAPPAN BROWN. A cheap, rich, and durable greenish-brown pigment, deriving its name from an estate belonging to lord Audley near Cork in Ireland. It is composed of peat and manganese, is easy to work in water, but in oil has the depth and brilliancy of asphaltum, with the advantage of drying in a few hours. By levigation a lighter colour called *euchrome* is obtained, but this is not commended by BROCKEDON, in *Transactions of the Society of Arts*, etc., 8vo., London, 1838, li, part I, p. 141.

CAPPELLE (JAN BAPTIST VAN DE), born at Ghent 28 October 1772, built in that city several houses on the quai aux Tilleuls, one in the marché du Vendredi, one in the rue du Marais, and three in the rue des Champs; restored and enlarged the churches at Somergem, Vinderhout, and Lovendegem; built the *gementehuis* or *maison communale* at Ninove; a house in the grande place at Alost; a *casteel* or *château* at Oostacker; another at Moerbeke; enlarged another at Vinderhout (given in GOETGHEBUER, *Choix des plus beaux Monuments*, fol., Ghent, 1827, p. 49); and another at Cluyse; constructed 1821-3 a *lusthuis* or country house at Destelberge (given in the same work, p. 70); and with Jacques Goetghebuer, another at Nevele near Ghent. 101.

CAPPELLO, see CASTELLI (FRANCESCO).

CAP-PIECE. The old term for a lintel to a doorway, or for the lining to that lintel. 13.

CAPPING OF A WALL, see COPING.

CAPRA. There have been several Cremonese architects of this name; among the most distinguished were PIETRO and FRANCESCO, probably brothers, living in 1570 (whose house in Cremona, No. 393, built in 1499 by an ancestor, near the parish church of S. Agostino, has been somewhat altered from the *stilo Bramantesco*); the latter built 1578 the grandiose refectory, and 1594 part of the dwelling for the novices, of the Dominican monastery in that city: ORAZIO (son of Francesco), who was one of the attached architects to the cathedral, modernized the church of S. Francesco for the PP. Minori Conventuali, and rebuilt that of S. Victor for the Servites, as well as that of SS. Siro e Sepolcro, the front of the last being probably an alteration by Galdini: ALESSANDRO, a pupil of Giacomo Erba, is chiefly known by his publications, which are enumerated by ARISTO, iii, 5; among them is *La Nuova Architettura Panigiarie*, 4to., Bologna, 1678, which contains some curious remarks as to the use of molded bricks, the cure of smoky chimneys, and other points of construction, hydraulics, etc. He was buried in the now destroyed church of S. Leonardo at Cremona; leaving two sons and pupils, DOMENICO and GIUSEPPE. 57.

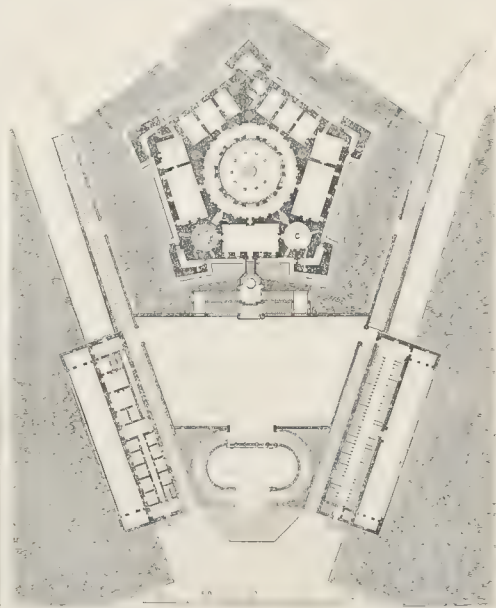
CAPRAROLA. A village near Viterbo in the Papal States, and about twenty-six miles from Rome. The chief buildings erected in it were the collegiate church of S. Michele; the church of Sta. Maria della Consolazione (seventeenth century); the Augustinian nunnery and church of S. Rocco, 1611; and the monastery and church formerly of Sta. Maria and S. Silvestro, now of Sta. Teresa dei Padri Scalzi, built in 1621 by Gir. Rainaldi (MILIZIA), or by Martino Longi the younger (SEBASTIANI), to which is attached at the extremity of the gardens of the palace, described below, the casino by Barozzi; this is of two stories in height, and has an open loggia of three arches both in front and rear, the upper floor being level with the garden in the rear; the sides of the lower story are flanked with steps leading to the same, and adorned with tritons, dolphins, and vases, through which water formerly flowed in a continuous stream. The lower terrace is enclosed by a balustrade on which terminals with vases are arranged at intervals; one of the fountains in the rear is given in *Illustrations*, pl. 82, fig. 3.

Caprarola, however, is most celebrated for the neighbouring residence erected for the cardinal Alessandro Farnese, nephew

of Paul III. It presents that mixed character of fortress and palace, which the residences of the nobles at that period very generally assumed, and amongst which it is undoubtedly pre-eminent, both from its imposing mass and marked originality of plan and arrangement. It is probable that the foundations of the palace and its pentagonal form were already commenced from the designs of Antonio San Gallo, when his death in 1546 led the cardinal to entrust the building to Giacomo Barozzi da Vignola.

Placed on the southern slope of Monte Cimino, it is approached by successive flights of steps gently rising from terrace to terrace. A portion of the lower story of the palace,

and the whole of the subterranean part is excavated in the tuff rock; the vaults in this rock below the central court which rests on a pillar in the centre, are worth visiting. It is elevated on a lofty rusticated basement, the military character of which is enhanced by projecting bastions at each of the angles, the whole being surrounded by a deep moat. The façades are in two orders, the angles over the bastions slightly project, thereby adding force and character to the design: on the lower of the



two stories these angles are rusticated, and on the principal front an open loggia of five arches spans the intervening space,

the order being Doric. The upper story is a richly treated example of fenestration with pilasters of the Corinthian order; the windows, small in size, give an idea of greater size to the building; the whole is crowned with a 'Vignola' cornice and a balustrade. Notwithstanding the harmony of each façade, the effect as a whole is marred by the divergence of the lines arising from the peculiarity of the plan. This is more particularly apparent when only two sides of the building are visible, the obtuseness of the angle giving an impression of false perspective highly offensive to the eye. The entrance in the centre of the principal or terrace front is a well known example of Barozzi's talent; it leads to a spacious vestibule, and thence into a central circular cortile 70 ft. in diameter (*Illustrations*, pl. 6). On the left of the vestibule is the principal staircase, also circular on plan, with consecutive stories of four orders, Doric to Composite, rising one above the other, which has been highly eulogized, but the result is more intricate than beautiful, and the effect produced is on the whole confused and unsatisfactory. The apartments, many of which are of noble proportions, are all finished with stucco and fresco decorations by the Zuccheri and Tempesta, each room illustrating some event in the history of the Farnese family: the designs were in some instances suggested by Annibale Caro. The variety of the arabesques is endless, and the compartments of the ceilings of the upper corridor surrounding the cortile merit the attention of the architect who would study the combination of architecture with painting, to be found in perfection only in Italy. Deserving of notice are also the tile pavements (that in the circular chapel, c. 32 ft. in diameter, is especially good), the molded chimneypieces, and some remarkable perspectives in painting by Barozzi himself. The gardens are a favourable specimen of the Italian style of the period. The estate passed in 1734, by the marriage of Philip V of Spain with Elizabeth Farnese, into the hands of the Spanish Bourbons: it is now the property of the king of Naples, and is fast sinking into decay. LEAS and DEBRET, *Œuvres complètes de Vignole*, fol., Paris, 1815; *Pianta Alzata ed ILLUSTRI FATTI FARNESIANI*, engraved by PRENNER, Rome, 1748; PRENNER, *Paintings by Zuccaro*, etc., fol., Rome, 1748-50; ROSSI, *Studio d'Architettura Civile di Roma*, fol., Rome, 1702-21; PERCIER et FONTAINE, *Célèbres Maisons de Plaisance*, etc., fol., Paris, 1809; URST, *De Caprarole Descriptione*, Parma, 1589, and Bologna, 1594; SEBASTIANI, *Descrizione del Palazzo*, 8vo., Rome, 1741, with corrections by FRA CASIMIRO DA ROMA, in *Memorie Storiche delle Chiese*, etc., dei Frati Minori, 4to., Roma, 1744, p. 52; the *Scenografia del Nobilissimo Palazzo*, engraved by MOGALLI; a large plan and two views by F. Villamena, 1617; and AVILER, *Cours*, 4to., Paris, 1720, pl. 73-75.

J. M. L.

CAPREOLUS. The Latin name for a brace or strut, used by VITRUVIUS, v, 1; x, 15, 20, 21.

CAPRI. A city in the island of the same name belonging to the kingdom of Naples. This island, anciently called Capreae, was celebrated for the palaces of Augustus, and the twelve villas of Tiberius: these are represented by some apartments in tolerable preservation; the remains of a temple and baths; and several ranges of arcades, not only belonging to rooms and passages, but to aqueducts: the works cut in the rock include, besides grottos and reservoirs, a large artificial cavern called the dock. Near these reservoirs is the old cathedral, dedicated to S. Costanzo, formerly a temple, and marking the site of the Roman town: the more modern cathedral, also dedicated to S. Costanzo; the former episcopal palace; and the government palace, although little better than the white stone houses of the modern town, are the only important buildings on the island except the villa Thorold, and the Cistercian monastery (1343-81), converted of late years into barracks; this is remarkable for a triple echo. SECONDO, *Relazione Storica dell' Antichità, rovine, e residui di Capri*, 8vo., Naples, 1750; HADRAVA, *Ragguagli di vari scavi e scoperte di Antichità fatte nell' Isola*, 4to., Dresden, 1794; and ROMANELLI, *Isola da Capri*,

ARCH. PUB. SOC.

8vo., Naples, 1816, have described the antiquities: and excavations have been lately recommenced, *ATHENÆUM Journal*, 1856, p. 522: the two first named works have been condensed in an account, with a map of the island, given in ACKERMANN, *Repository*, 8vo., London, 1810, pp. 211, 282, and 348. 28. 96.

CAPRICE. A French term adopted by English critics for any novelty caused by the mere desire of exhibiting the skill or originality of the architect, a desire that has generally tended to such abuses as the substitution of fancy for propriety, and as introducing inventions, forms, or features, unfit for the nature, whether real or traditional, of the subject. QUATREMÈRE DE QUINCY, *Encyc.*, s. v., in his classification of caprices, includes all plans which consist of an unnecessary avoidance of straight lines; all contrivances that are really useless, or false, or apparently dangerous; and all such variations from the original nature and intention of parts as broken pediments, as well as the masks, cartouches, shields, medallions, trees, shellwork, rocks, and clouds of the sculptural architecture of the seventeenth and eighteenth centuries. Barozzi and Buonfanti may be cited as examples of caprice, which degenerates into the BIZARRE, the BAROQUE, and the ROCOCO.

CAP-SILL. The upper horizontal beam in the timber framing of viaducts or bridges. In the Report of the Inspectors of the Eastern Counties Railway, 1856, the cap-sills were found to have taken the dry rot extensively. It was supposed that the vibrations occasioned by the passing of trains opened the mortices in a slight degree, but sufficiently to admit moisture and cause rot.

A. A.

CAPUA. A city, founded A.D. 856 upon the site of the Roman town of Casilinum, about three miles from the ancient Capua, in the province of Terra di Lavoro in the kingdom of Naples. It contains a cathedral, dedicated to S. Stefano and Sta. Agata, rebuilt 1703-28, with eighteen granite columns (GRANATA, *Storia Sacra*, 4to., Naples, 1766), having a font made of an antique bath of African granite (? verde antico) resting on two marble lions, which formed part of the Romanesque pulpit in the former building; in the inner portico of the inner atrium in front are nine old marble tombs; an archiepiscopal palace, chiefly 1573-1602, restored 1744-64, with gardens between it and the river Voltorno; eighteen churches, including S. Giovanni, built 1725 by D. A. Vaccaro; those of twelve fine monasteries, especially that belonging to the Theatines, finished 1748, and standing between the *udienza* or palazzo della città and the palazzo del governo, with the criminal tribunal and prisons on the north side of the great square or *piazza dei giudici*; a fine seminario, 1568-1617, with its library, 1703-28; eighteen convents and other religious edifices; a *corpo di guardia*, forming the west side of the above named piazza, and facing the *baglia* or civic tribunal, and *curia dei notai*; the palazzo Pellegrino or *del generale*, with many other old and large palazzi, and three fountains. The ancient bridge at the porta di Roma was probably repaired 1212-50, when the towers were added by Fuccio of Florence according to MILIZIA, who also states that Ferdinando Manlio built a bridge in the sixteenth century; but GRANATA, *Storia Civile*, 4to., Naples, 1752, i, 88, iii, 35, who gives a plan of the city, and RINALDO, *Memorie Storiche*, 4to., Naples, 1753, ii, 176, show that only the bridge gates were remodelled in 1557. The monastery of Spirito Santo, between the modern and ancient towns, was built 1540. 96.

CAPUA (Etruscan, Vulturum). The large Italian village, called Sta. Maria di Capua, or Sta. Maria Maggiore, from a church to which the episcopal throne was removed after the destruction of the cathedral of S. Stefano, GRANATA, *Storia Sacra*, 4to., Naples, 1766, i, 33. This collegiate church is five-aisled, with divisions formed by fifty-two columns, those on each side of the nave being of the marble called *porta antica*: the building was enlarged and restored a little before 1766 by Michele Blasio and his successor Luca Vecchione, both of Naples. Among the magnificent palazzi in this casale, or rather town, that called della Mensa Arcivescovile, built for cardinal



Camillo Melzi (archbishop 1636-61), is especially mentioned. Besides the remains worked into the existing buildings, there are traces of a theatre, and considerable ruins of one of the most magnificent Roman amphitheatres in Italy, which is said to have held 87,000 persons: parts of each corridor exist, and two of the seventy-four arches that formed the lower story of the outer wall. **TEXIER** gives the external size as 557 ft. 5 ins. by 453 ft. 0 ins., and the internal dimensions as 249 ft. 9 ins. by 150 ft. 4 ins.; but the sizes are given as 553 ft. 0 ins. by 451 ft. 6 ins., and 254 ft. 10 ins. by 151 ft. 4 ins. by **MAZUCHIUS**, *In mutilum Campani Amphitheatri titulum, etc., Commentarius*, 4to., Naples, 1727. **RONDINELLI**, *Antica Topografia*, 4to., Naples, 1815, iii, 578-84; **GRANATA**, *Storia Civile*, 4to., Naples, 1752; **RINALDO**, *Memorie Istoriche*, 4to., Naples, 1753. A plan, etc., are given by **SAINT NON**, *Voyage Pittoresque de Naples, etc.*, fol., Paris, 1781, ii, 231, 244, who also mentions many important tombs on the road to Caserta, and gives two corrected illustrations, viz. of one circular in plan, with engaged columns separated by a blank wall and a niche alternately except at the back, where there are no niches, and with an attic of less diameter with pilasters which probably received a dome; and of another with a high square pedestal carrying a mass of which the four concave faces, each containing a central niche between two smaller ones, are separated by a baseless column; above this is a circular attic, decorated with niches between columns of a Corinthian or Composite order, and carrying a circular solid lantern. 28. 96.

**CAPUCIIN**, see **FRANCISCAN BUILDINGS**.

**CAPULA** (**GIOVANNI**), probably a Pisan, designed in 1305 the tower of S. Pancrazio, and in 1307 that of the Elephant, at Cagliari in Sardinia, according to an inscription given in **VALERY**, *Voyages en Corse, etc.*, 8vo., Paris, 1837, ii, 160, 162.

**CAQUE** or **CAQUET** (**LE SIEUR . . . . .**), in 1745 erected the façade instead of that designed by **le Mercier**, and made alterations in the church of la Congregation des Prêtres de l'Oratoire, also called the chapelle royale du Louvre, in the rue S. Honoré at Paris, engraved by **BLONDEL**, *Arch. Fran.*, fol., Paris, 1752, iii, 57, who, *Cours*, 8vo., Paris, 1772, ii, 189, shows that it is in some respects an improvement from the front of the church of the hôtel des Invalides.

**CARACAS** or **CARACCAS**, see **JAGO DE LEON (SANT')**.

**CARACCILOLO** (**GIUSEPPE**) erected the church attached to the S. Monte e Banco de' Poveri del nome di Dio, close to the palazzo de' Tribunali at Naples, in 1616. 95.

**CARACOLE**. A French term used by some English authors; a staircase "en caracole" is a winding, or helical, or spiral, or cockle staircase, a vice (*Fr. vis*), or a turnpike.

**CARAGO**. An old measure, which when used for lime, contained sixty-four bushels. 4.

**CARALIS**. The ancient name of **CAGLIARI** in Sardinia.

**CARANA PALM TREE**, see **MAURITIA**.

**CARAPA** (*taïla-non*). A wood of Tavoy used in house building: *C. guianensis* (*carapa*), a wood of Trinidad, bears a considerable resemblance to cedar, is extensively used, and is much esteemed: its diameter varies from two to three feet. 71.

**CARAVAGGIO**, see **CALDARA (POLIDORO)**.

**CARAVANSERAI**. The name given in the Turkish and Persian dominions to a house (corresponding to what is called in Ireland a dry lodging, because nothing is supplied but accommodation) for the reception of travellers. The idea of providing such resting places appears to have arisen in Asia Minor, and to have been copied by Cyrus, who first established in Persia stations for his couriers, which were also at the disposal of travellers. Similar buildings have been maintained by the governments in Hindostan; indeed the distance of towns from each other, and the want of hostleries in the villages, would render communication in the East so impossible if such places did not exist, that they are erected at almost every five miles on some roads, as on that from Bagdad to Meshed Ali. **HERODOTUS**, v, 52, enumerates on the road from

Sardis to Susa one hundred and eleven princely *σταθμοί*, answering to the *mansiones veredariorum* of the Romans and the modern posthouses, placed about seventeen miles apart, besides beautiful *καταλύσεις*, *mansiones diversorium* of the Romans, answering nearly to the caravanserais of the present time, which are more architectural and less dilapidated in Persia than in any other country, although the existing buildings were chiefly erected during the reign of Shah Abbas (1582-1627). Next in importance to these are the Turkish ones, to which the term **KHAN** is usually given, though it is better restricted to an establishment in a town, only differing in being at the same time a warehouse, like the *maison* established in the principal cities of Europe by the Hanseatic League. **IMARETH**; **MEDRESSEH**. Many Persian buildings of this class have been erected from a feeling of religious duty; several from the Persian desire of posthumous fame; but in Turkey permission to erect one has always been regarded as a mark of distinction, which has been reserved for the female relations of the sultans and for officers who had gained three victories. The general type is a square building occupying about two acres, with an open courtyard: the entrance is a hall with side divans for the seraskier or keeper, and some have side courts for females, as at Tchalesieh, shown in **TEXIER**, *Descr. de l'Arménie*, fol., Paris, 1842, pp. 210, 211, pl. 86, who also gives, pl. 90, a caravanserai at Tchimley, covered on account of the snow that falls in winter. In the centre is a square comprising about forty feet of solid masonry raised three feet, called the *bauri-kosh*, for baggage. A range of cloisters, forming a succession of recesses ten feet broad and high, serves either as apartments for travellers or as stalls for their cattle. In the centre of each side of the court is a vaulted assembly room. Outside the chambers a passage from the angles of the court gives access to the stables that occupy the external wall: thus one entrance closes the whole building, which is sometimes also fortified with bastions, and is always constructed without any woodwork. Some caravanserais have an upper floor over the whole, or part, of the building. **KEPPEL**, *Personal Narrative*, 8vo., London, 1827, i, 161.

**CARBON**. A solid body which occurs either in the form of a black dust without crystallization, or as a mineral (the graphite), or in a crystalline form (the diamond); its density as dust being 2.1; as a crystal 3.55. It is colourless, without smell, perfectly insoluble in water, infusible, and fixed; when crystallized it refracts light in a remarkable manner; in a state of powder it is a bad conductor of electricity, in the crystalline state it is rather a good conductor. Carbon combines with oxygen directly, by heat, and when the carbon is in excess the resulting compound is the oxide of carbon, which is the poisonous gas given off by a charcoal fire. When the oxygen, on the contrary, is in excess, the compound is carbonic acid, an ingredient of almost all impure or vitiated atmospheres affected by human beings, for during respiration the oxygen of the atmosphere is converted into carbonic acid by its passage through the lungs. According to **DUMAS**, human beings on the average convert about twenty gallons (in volume) of oxygen into carbonic acid in the hour; but it is important to observe that, in establishing a system of ventilation, it is more necessary to provide for the removal of the exhalations from human bodies, than for that of the carbonic acid they create. The latter may be absorbed by the introduction of slacked rich lime, for which it has a great affinity; no ventilation, however, can be complete, unless the whole of the exhalations be removed; this requires the introduction of about 212 cubic feet of fresh air per hour. Carbonic acid is present in most rain waters, and is considered by **SENMARMONT** to confer upon them much of their solvent power upon building materials. Carbonic acid is said to be absorbed by mortar and to cause it to harden. **AIR**; **ATMOSPHERIC INFLUENCE**.

By combination with hydrogen a numerous series of hydrocarbons are formed, having a strong smell like essential oils; and carbon combines, indirectly, with azote and a certain

number of metals, such as iron, zinc, copper, tin, etc., in these cases without affecting any definite proportions. The diamond, coal, anthracite, graphite, lignite, etc., are the forms under which the carbon generally appears in nature; and in combination it forms the base of all organized bodies.

Water combines with one-fiftieth of its volume of carbonic oxide; and it absorbs about its own volume of carbonic acid gas at ordinary temperature; but it may be made to take up considerably increased quantities by pressure. Carbonate of lime is soluble in water saturated with carbonic acid; and indeed it would appear that even felspar and some forms of silica are eventually dissolved by water of that description. G. R. B.

**CARBONATE.** The saline combinations of the acid resulting from the mixture of carbon and oxygen (in which the carbon is in excess) with a base, such as lime, magnesia, potassa, lead, iron. Where the acid and base combine in various proportions, it is customary to distinguish the result as the *bi-carbonate*, the *super-carbonate*, the *sub-carbonate*, the *proto-carbonate*, or the *per-carbonate*. G. R. B.

**CARBONEL (ALONSO)** finished in 1624 the *retablo-mayor*, now destroyed, of the Merced at Madrid; was *aparejador* in 1627 to the works of the alcazar in that town; the palace del Pardo; and the casa del Campo; succeeded in 1629 to Lizargate in the completion of the monastery at Uclés, designed about 1560 by Gaspar de Vega; became *aparejador-mayor* of the royal works by brevet dated 9 November 1630; and was then employed at the monastery of the Incarnation; erected in 1635 the garden hermitage of S. Antonio at the Buen-retiro; commenced as *maestro-mayor* in 1633 the works at the palace of the Buen-retiro, from the designs of Juan Gomez de Mora; commenced in 1644 the erection of the *casas del ayuntamiento* and prison at Madrid except the entrances, finished in 1656; succeeded to de Mora by brevet in 1648 as *maestro-mayor* of the royal works; designed in 1654 the entrance, staircase, pavements, and altar, executed by Bartolomé Zumbigo, in the *panteon* at the Escorial; and died in September 1660.

GINÉS, his son, was much employed on the works of the convento de la Merced Calzada at Madrid; and BLAS, his nephew, became in 1641 assistant at the royal works in Spain, and died at an early age in 1645. 66.

**CARBONIC ACID AND OXIDE**, see CARBON.

**CARBURET.** The substances resulting from the combination of carbon with other inflammable substances, or with metals, are called carburets; thus steel is a carburet of iron. G. R. B.

**CARCASS.** The technical name applied to a building completed only as far as the essential parts of construction and covering. The term was originally given to the framing or skeleton framework of a timber edifice, before it was lathed and plastered; it is now applied to a brick or stone edifice containing the partitions, floors, and roof made by the carpenter, before they are clothed by the joiner and plasterer. PARQUETRY.

**CARCASS FLOOR.** The joists and other timber prepared to receive the floor boards. **CARCASS ROOF.** The timbers of a roof prepared to receive the slating or other covering.

**CARCASSONNE.** The capital of the department of the Aude in France. NODIER and TAYLOR, *Voy. Pitt.*, fol., Paris, 1837 (Languedoc), ii, pt. 1, pl. 120-26, give views of the Visigothic and internal later (1270-85) walls, described and illustrated by VIOLETT LE DUC, *Dict.*, i, 331-6, 379, the *porte Narbonne*, the castle, the *tour de trésor*, and an interior view of the cathedral, dedicated to S. Nazaire, remarkable for the break (*pli*) in its vaulted roof, which was commenced on a semicircular but finished with a pointed section: the church was in course of construction in 1096, the choir was enlarged in 1269, the *rond point* and the Roquefort chapel were erected 1301-21, and the Rodier chapel 1326-9. The *basse ville* contains the other cathedral, dedicated to S. Michel, having the body of the edifice in the *style ogivale secondaire*, with a modern chapel at one end (BOURASSÉ, *Cathédrales*, 8vo., Tours, 1843); the tall tower of the church of S. Vincent, now an observatory,

ARCH. PUB. SOC.

the *hôtel-de-ville*, and the *halles* or covered market-places, are worth attention. NODIER gives a vignette of the principal fountain. BOUGES, *Hist., etc., de la Ville*, 4to., Paris, 1741.

**CARCEMARADOO.** A dark brown wood of Travancore, from two to six feet in circumference, used for buildings and carriages. 71.

**CARCER.** The name given to each of the cells or divisions for the chariots arranged previously to starting on the race in the ancient stadium and circus; a basso-rilievo in the Museo Borgia at Veletri, showing the elevation of the *carceres*, is engraved by SAINT NON, *Voy. Pitt.*, fol., Paris, 1781, ii, illustrating the circus of Romulus the son of Maxentius, improperly called the circus of Caracalla: it is observable that these cells were arranged on the arc of a circle having its centre in the middle of one part of the course where the spina began to divide the stadium, and the *carceres* were therefore not at right angles to the axis of the building, in order that all the chariots might traverse an equal distance from the *carceres* to the centre of the course opposite the end of the *spina*. 25.

**CARCHESIUM.** A Latin term translated *MORTISSE* by GWILT, *Vitruvius*, x, 15, but perhaps a pivot, as to a crane.

**CARD**, or **MANCHESTER CARD.** It consists of a number of closely set, bristling, fine-drawn iron wires, fixed on a strong web, used for the primitive 'teazle' in the manufacturing districts. After the card is worn out for its original purpose, it makes the best conceivable instrument for removing *whitewash* from the walls of buildings. According to the nature of the moldings, the brush must be formed into different shapes; a set generally consists of fifteen brushes, but a carpenter can easily make any shape required. Being very flexible, it does not injure any stone except Clunch, on which it must be used cautiously; *ECCLÉSIOLOGIST Journal*, 1847, vii, 41.

**CARDAVERAIZ (DOMINGO)** executed in 1605 the principal frontispiece of the Ionic order to the church of Guetaria, in the province of Guipuzcoa in Spain. 66.

**CARDI (FRA LODOVICO or LUIGI)**, also called Cigoli from his birthplace in Tuscany, was born 21 Sept. 1559. Having studied under B. Buontalenti, he designed at Florence the arches and other decorations for the festivals of the marriage of Mary de' Medici with Henry IV of France; the *loggetta* of the Doric order at the corner of the palazzo de' Tornaquinci (RUGGIERI, *Scelte*, fol., Florence, 1755, i, 38-9); the cortile (GRANDJEAN, *Arch. Toscane*, fol., Paris, 1846, pl. 58-9; RUGGIERI, ii, 25-35) of that Strozzi palace at the corner of the stradas dei Balestrieri and degli Albizzi which was commenced by Buontalenti; a doorway (Tuscan) to the gardens dei Gaddi (RUGGIERI, i, 41); the gateway of the convent of Sta. Felicità (RUGGIERI, i, 40); the Doria and Usembardi chapels in the church of S. Trinità; and the Renuccini palace (RUGGIERI, ii, 66-72), which is esteemed his best work. At Rome he erected several small works, besides making designs in competition with Maderno for the fronts of S. Peter's. He died 8 June 1613. 3. 28. 32. 33.

**CARDIGLIO MARBLE.** A grey variety of CIPOLLINO MARBLE, obtained from Sicily, according to ANSTED, *Elementary Course*, 8vo., London, 1850, p. 257.

**CARDO.** The Latin name for a pivot, such as that in the Egyptian collection at the British Museum, and for a hinge like those among the Roman antiquities in the same place, whence *cardinalis scapus* means a hinge style, as well as for a base-line in surveying: FESTUS, s. v. *Decumanus*; *cardo securiculatus*, as used by VITRUVIUS, x, 15, is supposed by GWILT to mean a dove-tailed tenon: see also x, 20 and 21.

**CARDONA Y PERTUSA (DON JOSEF DE)**, born at Valencia in Spain, was a pupil of Tosca, and became cavalier of the order of Montesa. He designed the church of the Minims, 1725-39, with its belfry, and also the sacristy of the parish church of S. Martin in his native city, where he died 15 June 1752. He was buried in the church of the convent of S. Francisco. 66.



**CARD ROOM.** The name given to a room or suite of rooms in a club-house or mansion for the reception of persons playing with cards. As such engagements occupy the latest portion of the day, the apartment does not require to be well lighted except by artificial means; but abundant ventilation is of the highest importance, and for this reason several old club-houses have metal flues taken from the ceiling of the card room (although of considerable height), through the upper stories and roof. The usual size of a whist table is 3 ft. square.

**CARIAN MARBLE,** from Mount Iassus or Iasus, near Halicarnassus, on the coast of Caria in Asia Minor, had oblique veins, livid white and blood red. **PAULUS SILENTIARIUS**, *Ephr.*, ii, 213.

**CARIATI.** A city in the province of Calabria Citeriore in the kingdom of Naples. Cariati Vecchio marks the site of the ancient Paternum; Cariati Nuovo is about two miles from it. The former, surrounded by a solid wall, contains a pretty cathedral dedicated to S. Michael, two monasteries, and a *seminario*. 96.

**CARILEPHO**, see **KARILEPHO** (WILLIAM DE).

**CARINOLA.** A city in the province of Terra di Lavoro in the kingdom of Naples. It contains a pretty cathedral, a collegiate church, a *seminario*, and a Franciscan monastery. 96.

**CARL** or **CARLS.** The name of a family of architects between 1560 and 1660; according to the epitaphs given in *GRUNDHERR*, *Norischer Christen Freydhöfe Gedächtniss*, 4to., Nuremberg, 1682, p. 57 and 286. The most distinguished was Peter Carl (called Cart by *MILIZIA*), of Helling near Nuremberg, born 1541: he built 1597-9, over the river Pegnitz at the last named town, the Fleisch brücke, esteemed at the time as a *chef d'œuvre*, being a single segmental stone arch 97 ft. 2 ins. in span, with a rise of 12 ft. 9 ins., 4 ft. thick, and 40 ft. broad: he also obtained considerable reputation from his works at the castle of Heidelberg, where he died in 1617. His son Johan was *zeugmeister* and engineer to the city of Nuremberg, and directed the works of the church of the Holy Ghost at Ratisbon. He died 1665 according to *NAGLER*, but the tomb is dated 1651.

**CARLADO**, see **COLLALLO STONE**.

**CARLI** or **CARLEE**, see **KARLI**.

**CARLIER** (DON FRANCISCO) was the son and pupil of Renaud, a French artist, who was *arquitecto-mayor* to Philip V of Spain, and died at the Escorial 15 August 1722. The son was commissioned to erect the church at the Pardo; that of the Premonstratensian monks at Madrid; a large mansion in the calle de los Reyes in that city; became in 1744 director of the academical school of architecture; in 1750 designed the royal monastery of las Salesas at Madrid; was made honorary director in 1752 in the Academy of S. Fernando; and died at Bayonne 29 December 1760. 66.

**CARLINE NOSE STONE.** A stone of Scotland obtained in the Frith of Forth close to Queen's Ferry. It is of the basaltic formation; of a deep brown colour with olive tint; and much used for engineering purposes in the north of England. The octagon pillars supporting the clerestory in the church for the seamen of the port of London, erected 1846-7, in Dock-street, are of this stone. w. c.

**CARLISLE.** The chief city of the county of Cumberland in England. It is irregularly built on rising ground between the river Eden and its tributary the Caldew. The streets are well paved and lighted, and since 1846 the town has been supplied with water from the Eden; a complete system of sewerage was carried out 1851-5, under the direction of R. Rawlinson, at a cost of £23,300. The river Eden, formerly divided into two streams, was confined by embankments to the northern one, and crossed by bridge, built 1812-15 by Sir R. Smirke, costing £70,000, and having five elliptic arches, each 65 ft. span; five smaller dry arches cross the south bed of the river now filled up and used as a cattle market; the whole is built of white sandstone from the Cove, near Gretna in Scotland;

**WEALE**, *Bridges*, 8vo., London, 1843, pl. 51-52. Caldew bridge, 1820, of three segmental arches; and Petteril bridge, 1830, about a mile from the city, of three semicircular arches, were built by Sanderson, the then bridge master; Nelson bridge over the Caldew, 1852, is by T. Hogg; and there are several good railway bridges in the neighbourhood.

The castle stands on a mound to the north-west of the city; the keep is of Norman date, but much modernized; a new stone roof, etc., was constructed in 1812. Its dimensions externally are 66 ft. by 61 ft., and 68 ft. high; the outer gate and that leading to the inner ward, of the fifteenth century, remain in a very perfect state; the rampart on the north side is supported by a series of huge picturesque buttresses. Behind the town hall is an ancient half-timbered house, formerly the meeting place of the trades' guilds. A mansion in Abbey-street, the Grapes hotel in Scotch-street, and the adjoining house, are specimens of seventeenth century domestic architecture.

The cathedral, dedicated to S. Mary, was commenced in 1092. The two eastern bays of the nave (the western part was destroyed in 1645), the south transept, and the lower part of the central tower piers, are of this date; they are principally constructed of white sandstone, the later portions being entirely of the red sandstone of the neighbourhood. The north and south aisles of the choir, and S. Catharine's chapel, which escaped the fire of 1292, are good specimens of Early English work. The choir, consisting of eight bays, was commenced soon after the fire, but was not completed until the end of Edward III's reign. In the reconstruction, the Early English moldings of the great arches, and the groin ribs of the aisle ceilings were again worked in, springing from the new Decorated pillars. The triforium and clerestory probably date after 1352. The latter, arranged in triplets of a centre three-light window with a single light on each side, exhibits some good examples of flowing tracery. The great east window of nine lights, and the finest example of flowing tracery in the kingdom, is 26 ft. 7 ins. wide in the clear, and 50 ft. 8 ins. high from the top of the cill to the apex of the tracery: the gable above contains a large segmental triangular window. The choir is covered by a semicircular oak ceiling divided into panels with foliated bosses, and coats of arms at the intersections of the ribs. From the feet of three of the main ribs on each side project large hammer beams, terminating in carved angels. The stalls and tabernacle work date 1401-19; the oak tracery screens in S. Catharine's chapel 1484-1507; the curious legendary paintings at the back of the stalls are of the same period; and the oak screen on the north side of the choir between 1542-7. The central tower was rebuilt 1401-19, with little ornament. It is 35 ft. square at the base externally, and 112 ft. high from the floor to the top of the battlements.

The building has just (1856) undergone a thorough restoration by Ewan Christian, at a cost of about £13,000. To strengthen the south front of the transept massive buttresses have been added, and a new entrance doorway of elaborate design inserted between them. The flat ceilings of the nave and transepts have been replaced by open oak roofs of the original pitch. In the choir the screens put up in 1764 have been removed, and the original ceiling restored, which has been decorated upon suggestions by Owen Jones. The stone used in the restorations was from the Cove quarries. The nave is 37 ft. long inside, 22 ft. 6 ins. wide between the pillars, which are 5 ft. 9 ins. diameter, and 69 ft. between the aisle walls; the transepts are about 22 ft. wide, and 113 ft. 7 ins. long from north to south; the choir is 134 ft. 3 ins. long, 34 ft. 6 ins. wide between the columns, and 72 ft. 6 ins. between the aisle walls; the height from floor to centre of ceiling is 72 ft. 10 ins.

Most of the conventual buildings which stood on the south side of the cathedral have been destroyed. The refectory, erected at the close of the fourteenth or early in the fifteenth century, is 79 ft. by 27 ft. internally. It is now divided into three parts, and used as a chapter house, library, etc. Near

the upper end is a passage in the wall with a stone seat, opening to the refectory by a traceried window, from which grace was said at meal times. Under the refectory is a large crypt dating about 1300. The ground floor of the deanery tower is arched with stone, and the present drawing-room on the first floor has a curious wooden ceiling painted with legends, etc., put up between 1507-20; the abbey gateway was erected in 1528. The iron railing and gates enclosing the cathedral yard on the north side were put up in 1838 from designs by R. W. Billings, and cost about £300. *BUILDER Journal*, xiv, 373.

There are four other churches: S. Mary, enclosed in the nave of the cathedral; S. Cuthbert, rebuilt 1778; Christ (Early English), of freestone from Hawk near Dalston; and Trinity (Perpendicular), of freestone from Newlands; these last were completed in 1830 from the designs of Messrs. Rickman and Hutchinson; both churches are 80 ft. long by 60 ft. wide, with a stone spire 132 ft. high, and each accommodates about 1000 persons. They cost together £13,212. The cemetery, consecrated 1856, thirty-five acres in extent, has only a portion yet laid out. The chapels (Decorated) and the entrance lodges, of red brick with Prudham stone dressings, are by Messrs. Hay of Liverpool. An obelisk 35 ft. high, 1856, by R. W. Billings, erected to the memory of Peter Nicholson, is given in the *BUILDING CHRONICLE*, i, 175. Of the nine chapels belonging to different denominations, the Independent chapel, Lowther-street, 1843, by John Nichol of Edinburgh, has a Jacobean front; and the Presbyterian chapel, rebuilt 1855-6 by J. Stewart of Carlisle, has a Norman front; it holds 650 persons, and cost £1,200.

The grammar school (Tudor), 1832, of red sandstone, has since been much enlarged; the Fawcett school (Tudor), 1850, is of brick with Prudham stone dressings. The citadel, *temp.* William II, was entirely remodelled and new buildings added to form courts of justice, etc., by Sir R. Smirke in 1810-11, at a cost exceeding £100,000. The buildings form two groups, and between them stands the white marble statue of the late earl of Lonsdale by Watson; the county gaol, 1827, cost £42,535 including an acre and a half of land, was designed on a similar plan to that at Bury S. Edmunds, by W. Nixon of Carlisle, who died before the works were completed, and was succeeded by C. Hodgson; the town hall has no architectural merit; the county infirmary (Grecian Doric), 1830, by R. Tattersal of Manchester, has a frontage of 134 ft. of white freestone, and cost including the site £5,498; the Carlisle news room and library (Decorated), 1831, by Messrs. Rickman and Hutchinson; the atheneum, by Williamson of Liverpool, and the lecture room of the mechanics' institute, by J. Hodgson of Carlisle; the Lord-street reading rooms (Elizabethan), 1851, by Hogg of Carlisle, are given in the *BUILDER Journal*, ix, 802. The citadel railway station (Tudor), 1847-8, by Wm. Tite, has a frontage of 400 ft. of Prudham stone; the booking office and refreshment room have open timber roofs; *COMPANION TO THE ALMANACK*, 1849, p. 247.

Messrs. Dixon's cotton spinning factory, by R. Tattersal, is of red sandstone; the main pile of buildings is 224 ft. long, 58 ft. wide, and 83 ft. high; the chimney, of brick with stone quoins, is octagonal, and 305 ft. high.

The bishop's palace, Rose castle, about seven miles south-west from Carlisle, was remodelled 1829 by Messrs. Rickman and Hutchinson; but little remains of the ancient buildings.

BILLINGS, *Illustrations of Carlisle Cathedral*, 4to., London, 1840; BILLINGS, *Illustrations of the Tracery of Carlisle Cathedral*, fol., London, 1842; CARLISLE, *The History of*, published by Jefferson, 8vo., Carlisle, 1838; CARLISLE, *Past and Present*, Guide Book, Carlisle, 1855; TAIT, *An Historical Sketch of Carlisle Cathedral*, London and Carlisle, 1855; JOLLIE, *Cumberland Guide*, 8vo., Carlisle, 1811; NICOLSON and BURN, *History of Cumberland*, etc., 4to., London, 1777; WINKLE, *English Cathedrals*, 8vo., London, 1842.

c. H. P.

CARLONE or CARLONI (CARLO and SILVESTRO), see CANEVALLI.

ARCH. PUB. SOC.

CARLONI (TADDEO), a Lombard, much employed at Genoa from 1560 as a sculptor, designed the façade of the church of Nostra Signora di Misericordia, in or near Savona; his pupil Daniello Casello finished his master's church of Pietro di Banchi (at Genoa?). Leonardo Ferrandina was another pupil. He died in 1613. 37.

CARLONI (TOMMASO), one of the sons of Giuseppe, brother of Taddeo, designed the choir of S. Siro (at Genoa?). 37.

CARLONI ( . . . ), a mistake for CANTONE (SIMONE) in the *Guidebook for North Italy*.

CARLOVINGIAN ARCHITECTURE. French authors have recently established two epochs of art, under the terms MEROVINGIAN (from Clovis to Pepin, 481-751) and CARLOVINGIAN (from Pepin to Hugh Capet, 751-987). The latter includes Notre Dame at Aix-la-Chapelle; S. Julian at Hoechst near Frankfurt; S. Aurelian at Hirschau in Württemberg; a church at Ottmarsheim in Alsace, which is a copy of that at Aix-la-Chapelle; the remains of an octagonal building in the church at Essen in Rhenish Prussia; and the porch of the atrium of the abbey at Lorsch in the duchy of Hesse, near Worms; as detailed by RAMÉE, who, explaining the illustration of the last named subject given by GAILHABAUD, *Monumens*, ii, supports the disputed, because early, dates given to these buildings.

FERGUSON, *Illustrated Handbook*, 8vo., London, 1855, p. 601, includes the porch and nave of Notre Dame des Doms at Avignon, with apparent justice; and S. Trophime at Arles; pp. 658 and 719, adds the churches of S. Menoux in Burgundy, and of S. Vincent at Soignies; and p. 560, says of the porch at Lorsch that it "is generally stated to have been built in the year 774, but—it seems rather the remains of some earlier buildings—if not, it will be necessary to bring down the date of the celebrated cathedral at Aix-la-Chapelle to Otho III" (983-1002); and p. 574, observes that if the age of the cathedral at Mayence is correctly ascertained (the end of the tenth century) "it would go far to confirm the date usually assigned to the portal at Lorsch, namely, the late Carolingian period." He coincides with other authors in considering the building at Ottmarsheim as at least a century later than its original at Aix-la-Chapelle, and in considering a church at Nimeguen of the same date as Ottmarsheim; while VIOLET LE DUC, *Diet.*, i, 134, 216, refers Ottmarsheim and the porch of Notre Dame des Doms to the eleventh or twelfth century. WOILLEZ, *Archéologie des Monuments Religieux de l'Ancien Beauvoisis pendant la métamorphose Romane*, fol., Paris, 1839-49, and BLAVIGNAC, *Histoire de l'Architecture Sacrée du Quatrième au Dixième Siècle dans les Evêchés de Genève, Lausanne, et Sion*, 8vo., Paris, 1853. DE CAUMONT, *Abécédair*, 8vo., Paris, 1850, has evaded the difficulty to some extent by the adoption of the term *style Romane primitive* for the work of the fifth to the tenth century.

Paper read 12 June 1856 at the Society of Antiquaries, by J. H. PARKER, on *Some Early Churches of France and Switzerland, partly of the time of Charlemagne*.

CARLOW FLAGS. The best quality are obtained from the quarries of Shankill and Kellymount in Kilkenny county in Ireland. The stone is a thin bedded siliceous grit, fine grained, of a dark greyish brown colour, very hard, and very durable. The face of the bed is sufficiently smooth, and does not require any dressing. Being non-absorbent, the flags are inclined to show damp in wet weather. It is suitable for common walling, but its chief use is for flagging, being conveyed into all the south-eastern, southern, and many of the northern counties besides Dublin. It is also used for roofs and other coverings where the weight is not objectionable. The inferior beds are apt to curl up and split when exposed to the sun's rays, but when used of sufficient thickness, or from the best beds, this fault is obviated. The flags vary in thickness from  $\frac{1}{2}$  in. to 4 ins., the greater number being 1,  $1\frac{1}{2}$ , and 2 ins.; 4 ins. are used for tombstones and common chimneypieces, and are rubbed and polished. They can be obtained as large as 12 to 14 ft. square, but for want of machinery it is not possible



to get them out of the quarry; the largest removed are about 10 ft. by 3 or 4 ft. The price at Shankill for flags less than 1 in. is 6d. per yard, more than 1 in. 1s., and for 4 ins. thick 2s. per yard; WILKINSON, *Pract. Geology*, 8vo., Lond., 1845, 209.

**CARLOVITZ** or **CARLOVACZ**. A city in the military district of Slavonia in Hungary. Besides four churches, one of them (the Maria-Fried) dating 1699, and another being cathedral, it contains the simple and noble palace of the only Greek archbishop in the Austrian dominions; his *seminarium*; a lyceum; and a Roman Catholic academy. 26. 50.

**CARLSBURG** or **KAROLY-FEJERVAR** (the Latin **ALBA JULIA** or **APULUM**). The capital of the county of Weissenburg in Transylvania, in the Austrian dominions. The principal gate; the stone cathedral, dedicated to S. Michael, and commenced 1441, about 280 ft. long by 120 ft. wide; two churches, monasteries, *seminariums*, and synagogues; the handsome episcopal palace; the canonry, which has become the State-paper office; the mint; the observatory; the barracks; the arsenal; and the citadel built by Charles VI (1715-38), are public buildings erected with architectural care. There are several ruins of an aqueduct and other Roman work. 26. 50.

**CARLSTAD**. A city in the district of the same name in Sweden. It is chiefly distinguished by the cathedral, built 1730, the town hall, and the theatre. 28. 50.

**CARMELITE BUILDINGS**. The Barefooted Carmelites or Thesians, have in each of their provinces a desert (It. *romitorio*) requiring a large area, as the cells of the monks are not only distinct, like those of the Carthusians, but separated, according to the new rule approved in 1580.

**CARMINE**. A name originally given to what is now called kermes lake, which formerly supplied the place of cochineal; it was afterwards applied to the finer sorts of cochineal lake; and ultimately to any pigment which resembles either kermes or cochineal lake in richness of colour and fineness of texture; thus although principally confined to the crimson and scarlet colours produced from cochineal by the agency of tin, the word is found in conjunction with very different words, as blue carmine, burnt carmine. Cochineal carmines vary from a rose colour to a warm red; but spinelle and red oxide of copper are taken as standards by ANSTED, *Elementary Course*, 8vo., London, 1850. The difference of the kinds, which are distinguished by numbers, is caused by the quantity of vermilion that is added to dilute the colour, and lessens the lustre, or else by the proportion of alumina used in the precipitation, that renders the hue paler than the standard. Carmine would be excellent pigments for water or oil, being little affected by sulphuretted hydrogen: but in combination with metallic pigments or ammonia they are not durable; and as a glaze are soon discoloured by the action of light. Field's carmine, or madder carmine, is proposed to supersede the cochineal carmines on account of its durability.

**BURNT CARMINE** is a purple prepared by partially charring carmines of cochineal or madder. **BLUE CARMINE**. 9.

**CARNAC**. A village in the department of the Morbihan in France. It is celebrated on account of the Druidical or Celtic work, at about a mile from it, the approach to which is marked by a barrow, called the *tombelle* de S. Michel, and surmounted by a chapel, at the eastern extremity of a group of standing stones as they are called in English, but **MENHIRS** or **PEULVANS** as they are termed by the archæologists of Bretagne. The term generally given by the French writers to the whole group is 'alignement de Carnac'; the intention of which is not known, and consists of four main divisions besides the **DOLMENS** or flat stones, and other scattered stones. That nearest to Carnac is called the *lande du Menec*; it has eleven rows of stones disposed in avenues from east to west, and at the west end these are closed by fifty-four stones about 5 ft. high placed on part of a semicircle, the chord being about 177 ft. long; two of the stones in this division are about 13 ft. long by 6 ft. 6 ins. square. Then follows the *champ de la fontaine Verguselle*, well aligned,

but with smaller stones. Next to this is the *Kervarieau*, east of which is a dolmen. Finally there are thirteen ranges of stone which curve a little to the northward. These stones have not been numbered carefully, but it seems to be allowed that about 1200 still remain, three-quarters of which vary from 3 ft. cube to 20 or 23 ft. in height. One of them at Carnac is formed into a rude cross; another on the road from the village to Auray is engraved with a cross; and on that road there are three dolmens. **NODIER** and **TAYLOR**, *Voyage Pitt.*, fol., Paris, 1845, i, have given seven plates to this subject, which has also been illustrated in **LABORDE**, *Monumens*, fol., Paris, 1816, i, pl. 5-6; by **GAILLEBAUD**, *Monumens*; and by **HUGO**, *France Historique*, fol., Paris, 1836, i, pl. 7.

**CARNAC** or **CARNAK** in Egypt, see **THEBES**.

**CARNATION COLOUR**. A rose red, very slightly tinged with yellow and blue, colour which may be lightened with white up to a flesh tint. 13.

**CARNUTES** or **CARUNTUM**. The Latin name of **CHARTRES** in France.

**CAROLINE BRECCIA**, see **BEAUDEAN MARBLE** and **BRECCIA**.

**CAROL**, **CAROLA**, **CARRALL**, or **CARROL**, see **CARREL**.

**CARONA** (**GASPARO DA**) under the date 23 July 1399, and **TOMMASO** under the date 14 September 1399, are entered in the list of architects to the cathedral at Milan, together with **MARCO**, who appears in that list from 19 October 1399 till 6 December 1401, and was specially consulted as to the construction of the sacristy and the general security of the fabric. **GIULINI**, *Memorie*, 4to., Milan, 1760, xi, 456. 27.

**CARPENTARIUS**. A late Latin term, frequently occurring in the *Necrologia Ven. Conv. S. Maria Novella de Flor. Ord. Prædic. ab anno 1225* (partly published by **FINESCHI** *Memorie Istoriche*, 4to., Florence, 1780), and translated by **MARCHESI** an 'architect'; the term employed for carpenter being *lignarius* or *lignorum faber*.

**CARPENTER** (**RICHARD CROMWELL**), **F.R.I.B.A.**, born 21 Oct. 1812, was a pupil of Mr. John Blyth of London. Chiefly engaged upon structures in the mediæval styles, his first work, erected in 1844, was S. Stephen's church at Birmingham; then followed, 1845-6, S. Andrew's, Bordesley, in the same city; those at Cookham Dean and Stubbington in Berkshire; Nutley in Sussex; Kemerton in Gloucestershire; Monkton Wyld in Dorsetshire; S. Paul and All Saints, both at Brighton, and S. Peter the Great at Chichester, in Sussex; Christ church, Milton-on-Thames, in Kent; Bovey Tracey in Devonshire; S. Mary Magdalen, Munster Square, in London; one at Galashiels in Scotland, and another (lately carried out) at Burntisland in Fifeshire. His largest works are the college of S. John at Hurstpierpoint, 1853, costing nearly £20,000; and the college of S. Nicholas at Lancing, 1854; both in Sussex. He designed the chancel screen and stalls for the new church of Kilndown in Kent, where he erected the parsonage, 1855, and in the churchyard a double high tomb, under a lofty canopy, for Lord Beresford, 1851; carried out restorations at Chichester cathedral (west window); and at Sherborne Abbey in Dorsetshire; and designed the pulpit for Gloucester cathedral. Among the whole or partial restorations to twenty-two churches, should be mentioned that of Kirkby Stephen in Westmoreland. He erected about ten schools; eight parsonages; the almshouse at Belmont in Hereford; and made alterations at Campden house in Gloucestershire, and at Bedgebury Park in Kent, where he adopted the French *chateau* character to join with the Italian mansion. Amongst numerous other designs are those for three churches for the diocese of Tasmania; a model wooden church for colonial use, engraved with others in the **INSTRUMENTA ECCLESIASTICA**, and numerous painted glass windows. He was district surveyor at first for S. Luke's, Old-street, and the Liberty of Glass House-yard, and afterwards for East Islington, London. He died 27 March 1855, aged 42. William Slater was an early pupil. A more

detailed memoir is given in the *ECCLESIOLOGIST Journal*, xvi, 137, illustrating S. Nicholas college; remarks on some buildings, xiv, 264; xv, 429; xvi, 257; and *passim*: also *BUILDER Journal*, xiii, 165, and 333, 355, 375, illustrating the church in Munster-square.

**CARPENTER.** (It. *falegname*; Sp. *carpintero*; Fr. *charpentier*; Ger. *zimmermann*.) An artificer practising the handicraft of shaping and framing timber used in the construction of buildings, such as piles, sleepers, posts, planking, plates, lintels, bond-timbers, carcass flooring, furring, bracketing, centreing, partitions, battening, roofing inclusive of boarding to gutters and slates, and the application of the necessary iron-work; as well as any other rough work, such as fencing, etc.

**CARPENTER'S BENCH,** see **BENCH.**

**CARPENTER'S TOOLS.** The *saw*, whether used by hand or by mechanical power; the *axe*; the *adze*; the *chisel*, either as worked by hand or by morticing and tenoning machinery; the *planes* for making grooves, rebates, and moldings, by hand or by machinery; the *auger* and the *wimble*; the *draw-bore pin* or *hook-pin*; the *crowbar*; the *hammer*; the *mallet*; the *pincers*; the *mortise* and *tenon*; the *square*; the *plumb-rule*; and the *level*.

**CARPENTIER (MATTHIEU LE)**, born at Rouen, 15 July 1707, was one of the architects most employed at his period in Paris, where he executed the *hôtels* de la Guiche; de Beuvron; de Lassai, in the rue du Regard; de Monsieur Bouret at the porte de Richelieu, adjoining that of Monsieur Duchatel which he enlarged and altered after its erection for Monsieur de Crozat by Cartaud in the rue de Richelieu; the *collège* de Bourgogne and its church; the *pavillon* or château of Monsieur de la Boissière in the rue de Clichy near the Barrière; and the alterations, in 1749, of the *hôtel* des Mares or de Luxembourg, erected in the rue S. Marc by L'Assurance; besides these he designed the *pavillon* du Roi at Croix Fontaine, and the new buildings at the Abbaye de Clairvaux, and published *Recueil des plans coupes et élévations du nouvel hôtel de Ville de Rouen, dont la construction a été commencée en Mai 1757, avec les plans d'un accroissement et autres ouvrages projetés pour cette ville*, fol., Paris, 1758: the first stone of this hôtel de ville (which he carried as high as six feet out of the ground, when the works were suspended for want of funds) was laid 8 July 1758. He became architect to the king, was elected a member of the Academy of Architecture in Paris 1755, and died 15 or 16 July 1773. *BLONDEL Arch. Fran.*, fol., Paris, 1752, iii, 90, 95; and *Cours*, 8vo., Paris, 1771, i, 114, 388; *PATTE Monumens*, fol., Paris, 1767, pp. 6, 178. Although his name only appears as Matthieu in his book, he is called Antoine Mathieu by QUERARD; the *BIOGRAPHIE UNIVERSELLE* s. n. *Carpentier* and *Lecarpentier*, calling him Michel Antoine, states that he was born 1709, went to Paris in 1728, and became *architecte de l'arsenal, des domaines, et des fermes générales du roi*; adds to the *hôtel* de Beuvron above-named (but the interior only in that building), the construction, or rather the continuation, of the palais Bourbon for the Prince de Condé; the buildings of the arsenal; and the châteaux of Courteilles, of La Ferté in Le Perche, and of Ballinvilliers on the road to Orleans; and asserts that he died in 1772. 45.

**CARPENTRAS** (the Latin *CARPENTORACTE*). A city in the department of Vaucluse in France, surrounded by walls and towers in good condition, although built in 1363, and having four gates equidistant from each other. The houses are well built, but form narrow streets. The only antiquity is the triumphal arch, shown in *LABORDE Monumens*, fol., Paris, 1816, pl. 104-105, but now freed from serving as part of the kitchen of the former episcopal palace de Bichy, so called from its builder the cardinal-bishop of that name, 1630-1657, but since converted into the palais de justice. The cathedral, dedicated to S. Suffredus, and containing columns taken from the remains of a temple to Diana at Venasque (Vindisca), was rebuilt in 1405, and has an attached tower dating from the

tenth century. The porte d'Orange, a stately and very perfect gateway, surmounted by a high tower; the hospital, with a highly praised front and staircase, 1751; the theatre; the public laundries; the markets and the new prisons, are the chief public works, except the aqueduct, finished in 1734, that feeds the fountains in the *places*, and thus supplies all the water to the houses in the city; this aqueduct crosses the valley of the Auzun by forty-eight arches. See *Illustrations*, plate 3 of **AQUEDUCT**. 14. 28. 50. 96.

**CARPENTRY.** (It. *arte del legnajuolo*; Sp. *carpinteria*; Fr. *charpenterie*; Ger. *zimmerwerk*.) The theory and practice of framing timber. The employment of timber in the construction of a building has been divided by NICHOLSON and others into three branches: *mechanical*, which inquires into the nature and properties of wood with the relative strength of timbers, and the strains to which they may be subjected by their arrangement and disposition; *descriptive*, which is sometimes called "finding", as containing the rules for discovering geometrically the lines for forming every timber required; and *constructive*, which includes the practical methods of reducing the timbers and joining them where required. **BRIDGE**; **CENTRE**; **JOINERY**; **TIMBER**, etc.

The following list comprises works descriptive of carpentry in general. *BLANCHARD, Traité de la coupe des bois pour les routes*, 4to., Paris, 1729; *DE L'ORME, Nouvelles inventions*, etc., fol., 1561, and later editions, being tenth book of his *Œuvres*; *EMY, Traité de l'art de C.*, 8vo. and fol. pl., 1837; *FOURNEAU, L'art du trait de C.*, 4 vols., fol., 1768 and 1820; *FREZIER, Traité de Stereotomie*, etc., 4to., 1757; *HASSENFRATZ, Traité de l'art de C.*, 4to., 1804; *JOUSSE, De l'art de C.*, enlarged by DE LA HIRE, fol., 1751; *KRAFFT, Traité sur l'art de C.*, fol., 1820, and Supp. by THIOLLET, fol., 1840; *MONNIN, Traité de la C. civile*; *ADHÉMAR, Traité de C.*, fol., 1854, 3rd edit., enlarg.; *MESANGE, Traité de C. et des bois de toutes espèces*, etc., 8vo., Paris, 1753; *Vorlegeblätter für Zimmerleute*, etc., fol., Berlin, 1835; *ROMBERG, Die Zimmerwerks Baukunst*, fol., Leipzig, 1846-50; *ANON., Compendio de la C. en blanco y tratado de Alarifes*.

The works by NICHOLSON, and by BATTY LANGLEY; also ROBISON, *Treatise* in *ENCYC. BRIT. Suppl.*, reprinted with notes in his *System of Mechanical Philosophy*, containing a most valuable body of information; *MOXON, Mechanical Exercises*, 3rd edit., 1693; *HALF PENNY, Sound Building*, 8vo., 1725; *SALMON, Art of Building*, 3rd edit., 1748; **CARPENTRY and JOINERY, Elementary and Practical**, 4to., 1849; *HOSKING, Treatise on Building*, etc., in *ENCYC. METROP.*, 4to., 1853, last edit.; *MARTIN, C's*, etc., *Instructor in Lines*; *PAIN, Practical House C.*, 4to., 1823, and his other works; *POPE, Rules for Roofs*, etc., in *RICHARDS, Palladio*, 4to., 1663; *PRICE, The British C.*, 4to., 5th edit., 1765; *SMITH, Specimens of Ancient C.*, 4to., 1834; *SWAN, C's Complete Instructor*, 4to., 1759, and his *British Architect*, 4to., 1750; *TREDGOLD, Elementary Principles*, 4to., 1820, edit. by BARLOW, 4to., 1840; *WALLIS, The C's Treasury*; *YOUNG, Treatise on C.*, 1839; *SMITH, C's Companion*, 8vo., 1735; *HATFIELD, American House C.*, 8vo., New York, 2nd edit., 1852; *BARTHOLOMEW, Specifications*, 8vo., 1840; *GWILT, Encyc.*, 8vo., 1842; *CRESY, Encyc.*, 8vo., 1847.

**CARPI** (the Latin *BENETIUM*). A city in the duchy of Modena in Italy, which owed its chief embellishments to Alberto Pio, who was lord of Carpi in the first half of the sixteenth century. The fortifications were designed in 1518 by Federzoni, who commenced the cathedral, under the invocation of the Assumption, from designs given by B. Peruzzi; this edifice was recommenced in 1606, and was continued until 1665, when another Federzoni was engaged thereon; the splendid church of S. Niccolo dei Minori Osservanti was begun 1506, and finished after 1516 by Federzoni: the palazzo Pio, now called the castello, probably the work of B. Clemente Spani, 1512; the portico of the principal piazza; the episcopal palace adjoining the cathedral, are the chief buildings. P. Comi built 1585 an hospital; and Carlioli 1682 the tower and perhaps the church



of Sta. Maria de' Minori Conventuali, and also the façade of the church of the nunnery of Sta. Chiara. 12. 93. 96.

CARPI (GIROLAMO), also called da Carpi, and Bianchi of Carpi, and dei Grassi, was born at Ferrara in 1501, and prepared numerous designs for buildings belonging to different private persons, and also to Ippolito dei Medici, cardinal of Ferrara, who, having bought the garden at Monte Cavallo in Rome, invited Bianchi to that city, in order that this master might serve him, not in the buildings only, but also in the truly regal decorations of woodwork, etc., which adorned that garden, where the palazzo del Pontificio on the Quirinal now stands. Having obtained great credit by his labours, Girolamo was made in 1550 architect of the works then in course of erection at the Belvedere; a post which he soon resigned in order to return to Ferrara. While he was residing there in 1554, the palace called Castel-Vecchio di S. Michele took fire, and he restored it. He died in 1556 aged 55 according to his friend VASARI, but in 1568-9 according to BARUFFALDI, *Vite*, 8vo., Florence, 1844, i, 373, 399, and was buried in the church degli Angioli. His works were finished by Galassi. 30.

CARPINUS BETULUS (*baaz-guirgang* of Turkey), the horn-beam. It is a native tree of Europe, found commonly in copses, and frequently pollarded where winter shelter is required. It grows from 35 to 50 ft. in height, and about 15 to 18 ins. in diameter. The wood is coarse, tough, and well suited for cogs of wheels, planes, plumbers' dressers or mallets, and other things having rough usage. Neither the American nor the oriental specimens are useful for building purposes.

CARPION, in connexion with ICTINUS, wrote a treatise upon the Parthenon at Athens, in the construction of which he assisted; according to VITRUVIUS, preface to lib. vii.

CARPUSELI, in Asia Minor, see KARPUSELI.

CARR (JAMES) designed S. James' church, Clerkenwell, London, 1788-92. Henry, his son, built the hall of Salters' hall, S. Swithin's-lane, London, which was opened May 23, 1827. He died 3 March 1828, aged 56.

CARR (JOHN), baptized 15 May 1723, at Horbury, near Wakefield in Yorkshire. He commenced life as a working mason; settling in York previous to 1752, he obtained an extensive practice in that and the surrounding counties. About 1750 he built Kirby hall near Boro-bridge, for John Thompson, esq. (plain), from the designs of "the earl of Burlington and R. Morris", as stated in WOOLFE and GANDON, *Vit. Brit.*, fol., London, 1767-71, ii, 70, the frontage extends 110 ft.: designed 1754-5, the grand stand on the race course at York; about 1756, Heath, near Wakefield, for John Smyth, esq. (Ionic), WATTS, *Views*, pl. 84: 1760, Harewood house, near Leeds, for Edwin Lascelles, esq., afterwards earl of Harewood (Corinthian), his finest work, executed with stone from a quarry adjoining; 247 ft. 10 ins. frontage; the gallery is 77 ft. long, 24 ft. 6 ins. wide, and 22 ft. high; the interior decorations were by R. Adam; WOOLFE, ii, 23-28; NEALE, *Scats*, v, ser. 1: 1762, Tabley house, Knutsford, in Cheshire, for Sir Peter Leicester, bart., afterwards lord de Tabley (Doric), 343 ft. frontage; the columns of the portico are in a single block of Runcorn stone; the picture gallery, 72 ft. long by 32 ft. wide, was fitted up by H. Harrison of Chester; NEALE, v, ser. 2; ACKERMANN, *Repository*, ii, ser. 3, p. 1: this is called Oakland house in WOOLFE, ii, pl. 16-19: 1757-64, Lytham hall, near Preston, Lancashire, seat of Talbot Clifton, esq. (Corinthian), of brick with stone dressings, cost about £60,000: about 1762-8, Constable Burton, near Hull, Yorkshire, for Sir Marmaduke Wyvill, bart. (Ionic), 76 ft. frontage, WOOLFE, ii, pl. 36-7: 1768, Thoresby lodge, Nottinghamshire, for the duke of Kingston (Ionic), now the seat of lord Manvers, 92 ft. frontage, WOOLFE, ii, pl. 11-13: 1770, the east front of Wentworth castle, near Barnesley (Corinthian), for William earl of Strafford; "the gallery, one of the most beautiful rooms in England", is 180 ft. long, 24 ft. wide, and 30 ft. high; the house was built about 1730; NEALE, v, ser. 1: 1772, Aston hall, Rotherham, for lord

Holderness, by whom it was sold during its execution to Harry Verelst, esq., governor of Bengal: 1776, Basildon park, near Reading, Berkshire, for Sir Francis Sykes, bart. (Ionic), 275 ft. frontage, now belonging to J. Morrison, esq., for whom most of the rooms on the principal floor were completed by the late John B. Papworth, 1838-40; RICHARDSON, *Vit. Brit.*, fol., London, 1802-8, i, 12-14: 1776, the town hall and assembly room with market under, at Newark in Nottinghamshire (Doric), 90 ft. frontage; the large room is 80 ft. long, 30 ft. wide, and 30 ft. high; RICHARDSON, ii, 11-14: 1765-77, the basilica or county court house at York (Ionic), 170 ft. long by 70 ft. wide; the hall is 40 ft. long, 30 ft. wide, and 30 ft. high; each of the courts is 45 ft. high to the top of the dome, 30 ft. in diameter, supported by twelve Corinthian columns; RICHARDSON, ii, 1-4; also the debtors' and felons' prisons in the castle at York: 1772-7, the county lunatic asylum, 132 ft. long: 1778, Denton park, near Odey, for Sir Henry Ibbetson, bart. (Ionic), 273 ft. frontage, with stone from the estate, allowed by Carr "to be the finest and best that he ever met with for architectural uses"; NEALE, v, ser. 1; RICHARDSON, i, 54-56: 1779, Thornes house, near Wakefield, for James Milnes, esq. (Ionic), 207 ft. frontage; RICHARDSON, i, 51-53: 1779-84, the Crescent, 257 ft. span (and stables?), at Buxton, Derbyshire, for the duke of Devonshire (Doric): 1786, Farnley hall, near Odey, for Walter R. B. Hawkesworth Fawkes, esq. (plain), an addition to the Elizabethan building; NEALE, v, ser. 1: 1786-8, the county gaol in Lincoln castle (plain brick): 1788, the mausoleum at Wentworth house, near Rotherham, for the right hon. earl Fitzwilliam; STIEGLITZ, *Belle Architecture*, pl. 61: about 1791, the town hall at Chesterfield, Derbyshire: and 1791-3, rebuilt at his own expense the parish church of Horbury (Italian), and added the organ and peal of bells, costing altogether about £10,000. Undated works consist of Kirkleatham, near Guisborough, for Sir Charles Turner, bart., 132 ft. frontage; a mansion at Ravensfield, near Rotherham, for Col. Bosville; the bridge at Boro-bridge; Byrome hall, near Ferrybridge, for Sir J. Ramsden, bart.; and additions to Panty hall, near Wragby in Lincolnshire, the seat of Edmund Turnor, esq., the house having been built 1724 by N. Hawksmoor: other large houses were those for Wm. Reede, esq., at Sandhutton; for Thos. Mauleverer, esq., Arncliffe hall, 1753; for J. Mitchell, esq., Petergate in York, 1755; D. Mitford, esq., Northallerton; Mr. Thompson, Bootham in York; J. Dixon, Leeds, 1753; H. M. Cookschutts, esq., Huckwaite, 1748; Pye Nest and White Windows, both near Halifax; the mansion in George-street, Halifax, for the Rawson family; the Shay, in that city, for the Ibbetson family; and one for himself in York. As architect to York cathedral, he made in 1770 a general survey of the fabric. He was elected lord mayor of York in 1770, and again in 1785, and a magistrate of the West Riding in 1785; was one of the original members of the 'Architects' Club', established in London in 1791; died at Askham hall, near York, 22 February 1807, aged 84 years, and was interred at Horbury. Peter ATKINSON, an assistant, succeeded to many of Carr's works on his retirement from practice. MULVANY, in *Life of Gandon*, 8vo., Dublin, 1846, states from a memoir by Gandon, that it was Gwynn (and not Carr, as usually stated) who, through Kirby, introduced Chambers to the earl of Bute, as an instructor for the prince, afterwards George III, in the study of architecture: from a comparison of dates, this is most probably the correct statement. Notes, chiefly forwarded by J. B. Atkinson, esq., of York.

CARRARA MARBLE. A saccharine limestone, which if quite white, rivals chalk in being the purest of all limestones. The closeness of texture, owing to which it receives a finer surface than any other marble, has given it the false reputation of being the hardest and most durable of marbles. The quarries from which it is obtained are situated in five ridges ascending the south side of the mountain called Monte Sagro, 5540 feet above the level of the sea, and about twelve furlongs from the town of Carrara in the duchy of Modena in Italy.

In proceeding from Carrara the first quarries are found near the village of Torrano; that on the left hand is called Crestola (written Gnestola by BRARD, *Mineralogie*, 8vo., Paris, 1821, ii, 342), on the right are Zampone and (one of the highest) Ravaccione; further on are Fosse degli Angioli to the left, and Betogli or Betullio to the right.

The principal quarries at the beginning of this century were those called Pianello and Polvazzo, which are now inaccessible. There are about a hundred and fifty others, the marble from which, if white, is termed Carrara; the coarse grained, the veined, or coloured marbles being known by the names of their quarries, except in the case of white streaked with blue or purple veins, like that from Monte Silvestro, which passes under the general name of BARDILLA or Bardiglio, and is chiefly got from quarries situated several hundred feet above those furnishing the best white marble.

The quarries of Canal Grande, Colonnata, and Fantiscritti, were worked by the ancients, who called the marble Lunense (from a town, Luna, of which the ruins are seen at about six miles from Carrara), and Ligustrum (from the district Liguria): the places are shown from which the marble is said to have been taken that was used in the Pantheon at Rome; at all events, it was employed in the buildings erected at Rome under Augustus, according to STRABO; but the finer sort, fit for statues, was discovered about the time of PLINY, *H. N.*, xxxvi, 4, when the Italian sculptors immediately substituted it for the Parian and Pentelican marbles.

The quarries were opened afresh about the twelfth century, and furnished the materials for Niccolò Pisano and his successors. They are worked according to their strata, which in general dip at an angle of 60° to the horizon, in beds from 18 to 48 ins. thick, alternating with beds from 2 to 3 ins. thick, containing talc, asbestos, steatite, and crystals of sulphuret of iron. A block has been raised 30½ ft. long by 10½ ft. wide and 7½ ft. thick, or 2,400 cubic feet, weighing about 208 lbs. (according to BRARD, the weight being usually called 170 lbs.) per foot cube; blocks of eight, six, and four hundred cubic feet are still raised. The blocks are sometimes divided at water mills in the neighbourhood, and the marble is carried in carts drawn by oxen to the spiaggia or beach at Avenza, whence about two-thirds of the quantity lodged in the storehouses is shipped to England. A lately constructed pier is mentioned in the *BUILDER JOURNAL*, 1853, xi, 357, 660, with a statement of its results as regards shipping the stone.

The quarries of Cavetta, Cima, and Crestola, supply a marble for statues which, like that of Polvaccio, is smaller in grain than Parian marble, and is considered more delicate in colour, being less bright owing to a slight tendency to a greenish tint; when thin it is also semi-transparent: the Betullio is a very fine white in colour, but when exposed to the air becomes opaque, disintegrated, and very friable; although perfectly useless in Italy and other hot countries, it is much used in England for internal works, but where employed externally the inside becomes powder under an apparently sound surface: the Ravaccione, in beds with a distinct stratification, furnishes, like the Canal-bianco, large blocks of coarse grained marble, and is more homogeneous and harder than the above: the Zampone is hard, and white in colour; often spotted, veined, or even marked with bluish-grey beds: the Fosse degli Angioli is depreciated by its quartz crystals. HOFFMANN, in *Edinburgh New Phil. Journal*, 41.

CARRAT. An old term for a quantity of lead. BRITTON and BRAYLEY, *History, etc., of the Palace at Westminster*, 8vo., 1836, pp. 187, 200.

7 lbs. = 1 clavis.

182 " = 26 claves = 1 wager.

2184 " = 312 " = 12 wagers = 1 carrat.

CARRELL, CAROL, CARRALL, or CARROL (in late Latin *Carola* or *Karola*). DUCANGE, *Glossary*, s. v., observes, that *carole* was used in Normandy for the iron standard of a railing; and suggests that it meant not only the railing itself, but any place enclosed with a partition or screen; the GLOSSARY, 8vo., Oxford, 1850, adds that *carole* was applied in France during the fifteenth century to an aisle having one side formed by the screens of chapels. The SURTEES SOCIETY, editing *A Description or brief Declaration of all the Ancient Monuments*, 8vo., London, 1842, p. 70, observes that the north alley of the cloister at Durham cathedral was glazed; "and in every wyndowe iij pews or carrells, where every one of the old monks had his carrell severall by himselfe; all thero pews or carrells was all finely wainscotted and verie close, all but the forepart, which had carved wourke that gave light in at ther carrell doures of wainscot. And in every carrell was a deske to lye there bookes on. And the carrells was no greater then

from one stanchell of the wyndowe to another." The SOCIETY OF ANTIQUARIES, in *Some Account of Gloucester Cathedral*, fol., London, 1810, states that "the ten divisions for the windows (all the windows are glazed) in the south cloister are divided into twenty carrols; two carrols in each window;—their width four feet, and they must have extended from the window into the aisle six or seven feet." The statutes of the Premonstratensian Order mention "*carolæ, vel hujusmodi scriptoria*". 80.

CARRERA (PEDRO DE), born in 1679, at Besain in Spain; erected the façade (*portada*) of the collegiate church at Oñate; and the tower, praised for its solidity, of the parish church at Legazpi; and died in 1731. His son and pupil, MARTIN, erected the transept (*crucero*) and vaulting of the church at Mutiloa; the *casas consistoriales* at Mondragon; the parish church at Escoriaza; the two towers (*espadañas*) of the façade of the church of Sta. Maria at Tolosa, the *portada* being the work of his pupil Uzuidan; the fountain at Arechavaleta; two ironworks at Villabona and at Orozco; as many houses and a mill at Cegama, where he, in conjunction with his brother-in-law, Don Francisco Javier de Zumaeta, rebuilt the *crucero* of the parish church; and many other works, amongst which the parish churches of S. Pedro at Pasage, and of Orendain, were finished by his son and pupil, MANUEL, after his death, 31 August 1768. 81.

CARRIAGE. The old term for the timbers which assist in supporting the steps of a staircase, and generally consist of two pieces inclined to the pitch of the stairs; they are also called the rough strings. When two alternate flights, with a half-pace between them, are made, the carriage of the half-pace is constructed with a beam, called an *apron-piece*, laid parallel to the risers of the steps, and the joists for the support of the floor rest upon the beam. If there is only a quarter-pace, the beam which receives the strings at their upper ends is called the *pitching-piece*. The scantling given to joists of a similar length will be sufficiently strong for the strings. Carriage is also used for the strings into which the treads and risers of common staircases are housed, there being then only one, and sometimes no, rough string piece.

CARRY UP and BRING UP. The terms used by masons and bricklayers when referring to the erection of a wall. *Rau up* is too often the term now employed.

CART (PIETRO), see CARL.

CARTAGENA or CARTHAGENA (the Latin Carthago Nova). A seaport city in the province of Murcia in Spain. The straight and wide streets contain well-built houses with balconies, but otherwise very plain, although a red stone is abundant in the vicinity. The principal buildings are the five churches, one of which was formerly a cathedral; a convent; the barracks; the fine *presidio* or convict-prison, marine school, and arsenal called the *parque*; an observatory, and two hospitals, one of which is a large square building erected round two courts, three stories high towards the sea, but only one story high on the land side: of this SWINBURNE, *Travels*, 8vo., London, 1779, p. 128, remarked, that the plan and elevation are good, but the stone is so soft and friable, that the sea air has corroded it, and made it crumble away more than half. 85. 96.

CARTAGENA. A city in the province of Popayan in New Granada. The streets are straight and well paved, with ranges of uniform brick dwellings, two stories in height and covered with tiles: in front of the houses are galleries supported by short columns, which render the streets narrow and dark. The immense cisterns inside the walls of the town, a magnificent cathedral dedicated to Sta. Caterina, two churches, as many nunneries, several monasteries, a *seminario* and an hospital, are the chief public works. 96.

CARTAUD (SILVAIN) designed at Paris, in 1703, the façade and completed the church of the Barnabites near the Palais, BLONDEL, *Arch. Fran.*, fol., Paris, 1757, ii, 99; about 1704, a house for Monsieur de Croizat or Crozat le Jeune



(afterwards the *hôtel de Duchatel*, and altered by le Carpentier), in the rue de Richelieu, *Arch. Fran.*, iii, 90; a house for Monsieur Hurel, almost opposite the *fontaine Maubudé*, in the rue S. Martin, BLONDEL, *Cours*, 8vo., Paris, 1771, iii, p. 456, pl. 72; in 1723, the house of Monsieur Guillot in the rue des Mauvaises Paroles, *Arch. Fran.*, iii, 1; and, 1732, the house of Monsieur Janvry in the rue de Varennes, *Arch. Fran.*, i, 232; these three mansions were esteemed as models. He also designed, in 1739, the façade (*Arch. Fran.*, iii, 21) and finished the church of the Augustins dechaussés or Petits Pères, near the place des Victoires (commenced in 1629 by Galopin, altered 1656 by le Muet, carried up seven feet from the ground by Bruand, and continued by le Duc and by Gitard); his Ionic and Corinthian orders are given in the *Cours*, ii, 197, pl. 87. In 1742 he was elected a member of the Academy of Architecture in Paris; and as architect to the Duke of Orleans he erected, in 1751, the wing of the *palais royal*, next to the rue des Bons Enfants, *Arch. Fran.*, iii, 42. The celebrated *œuvre* in the nave of S. Eustache, considered to be the best production of its kind, was designed by him. Amongst his undated works were the *maison de plaisance* of Monsieur d'Argenson at Neuilly; a *château* at Bournonville; and the larger *château* at Montmorency as the *maison de plaisance* of M. Crozat the younger, which afterwards passed into the hands of the duchess of Choiseul; the plan, *avant-corps*, and its Corinthian order, are given in the *Cours*, ii, 176, pl. 81; iii, 102, pl. 15; and iv, 146, pl. 32. Cartaud died in 1758; his works have caused him to be numbered amongst the best French architects. 45. 60.

CARTHAGE. The only interesting remains of this Italian colony, which replaced the Phœnician rival of Rome, in Africa, are ruins of a circus, amphitheatre, theatre, reservoirs with peculiarly constructed vaulting, baths, and an aqueduct fifty miles long, by which water was obtained from Jebel Zaghwān. A very complete plan of these ruins is given by the Danish consul-general at Tunis, FALBE, with an explanation in the *Ausland Journal*, 4to., Stuttgart, 1836, Nos. 122-6, which has been reviewed on the spot by BARTH, *Wanderungen*, 1849.

CARTHUSIAN BUILDINGS. (It. *certosa*; Sp. *cartuja*; Fr. *chartreuse*, whence the English corruption of charterhouse; Ger. *carthause*.) The order was founded near Grenoble about 1085, and the present rule was confirmed in 1682. The general arrangements of these buildings deserve attention on account of the characteristic features arising from the austerity added by the Carthusians to the Benedictine rule. Only five houses of which the last remain at Bruges, and at Ste. Croix de Beauregard near Grenoble, and about a hundred and eighty houses of monks, of the Carthusian order have existed.

The monasteries of this order had generally two courts, the smaller next the entrance contained the priorial residence and the buildings allotted to secular purposes; females were not only excluded from the court, but even from the church, which therefore stood within the walls, and with the refectory and sub-prior's residence separated the smaller from the larger court. On holydays the monks took their meals together in the refectory, and went to the choir at the proper hours of Divine Service: but on other days some of the monks worked in the kitchen-garden, others at mechanical employments, but most were engaged in writing; all continuing solitary during the time they were not engaged in the church at matins, mass, and vespers, their diet being conveyed to them through a wheel (which had a shelf under it) working in the wall dividing each residence from the great court or cloister: for every monk had a dwelling complete in itself as in modern almshouses, and separated even from the cloistered walk by a corridor along the front of the house. This corridor, which was only open to the prior and to the owner, contained stairs to the loft or store rooms. Beyond the corridor was a living room with a fireplace; a chamber, with a closet or study, having a bed, a seat, a table, and a bookcase; a store closet and place for provisions; a small passage to the end of the garden, etc.; and, after

about the middle of the twelfth century, a garden. LLAGUNO, *Noticias*, 4to., Madrid, 1829, i, 106, excuses by "the manner in which the Carthusians arrange their churches" the disproportion of their church at Miraflores near Burgos, it being about 190 ft. long, 46 ft. wide, and 63 ft. high to the top of the vaulting; WELLS, *Pict. Antiq.*, 8vo., London, 1846, p. 74, notices that "the church is divided into three parts according to the customs of the order", of nearly equal lengths.

The best existing examples are at Pisa, seventeenth century; in Val d'Emo near Florence; at Trisulti near Alatri; el Paular near Segovia; at Xeres; and at Seville. Illustrations of that at Clermont, in VIOLLET LE DUC, *Dict.*, i, 307; at Pavia, having an upper story, in GAILLIABAUD, *Monuments*, etc., 4to, Paris; of S. Martino at Naples, in SAINT NON, *Voy. Pitt.*, fol., Paris, 1781, i, 77; and of Sta. Maria degli Angioli at Rome, in LETAROUILLY, *Edifices*, fol., Paris, pl. 316, 317.

CARTONPIERRE (Ger. *steinpappe*). A name given to several substances, amongst which is a substitute for tile, slate, or asphalt roofing, manufactured at Carlserona, and mentioned in GLAIRE and WALSH, *Dict. Cath.*, 4to., Paris, 1840, s. v. That which is generally known has since about 1840 been manufactured in England, although it had been employed for nearly forty-five years in France. The English preparation consists of the pulp of paper mixed with resin and glue; the French is said to be pulp mixed with whitening and glue; in both processes the mixture is pressed into boxwood or plaster moulds, backed with sheets of glued paper (previously molded in the English method), allowed to set, and removed to a drying room to harden. BRUN, *Nouveau Manuel*, 18mo., Paris, 1850.

The ENCYCLOPÉDIE MÉTHODIQUE, 4to., Paris, 1788, mentions *carton* or simple pasteboard as a material used for decorations, but in the ENCYCLOPÉDIE of 1772 it is not described as applied to that purpose. COMPOSITION. PAPIER MACHÉ. 71.

CARTOUCHE. This French word, derived from the Italian *cartoccio*, meaning a rolled sheet of paper, has been adopted in English with such corruptions as cartooshe, cartoosce, cartouze, cartridge, and cattooze; and in modern books has been wrongly explained as a modillion when employed inside a building, whereas it is clearly "a truss placed to support an entablature in place of a column", as defined by LANGLEY, *Builder's Director*, 12mo, London, 1751, in this sense it has also been applied to a keystone touching the entablature over an arch. The English translations 1736 and 1742 of PALLADIO, i, 20, expressly state that "none of these cartouches should come out of the cornice." PRICKE, *Art of Fair Building*, fol., London, 1670, shows the "cattooze" as the large pendent acanthus-leaf placed under the stays and raising pieces of the timber houses of that period: and in conformity with these authorities the term may be applied not only to the ornament, 6 in section, formerly used instead of a console in entablatures and in the coves of rooms; but to the many heterogeneous compositions (which cannot justly be termed consoles or brackets) of foliage, masks, fruit, etc., such as the side additions to the dressings of the windows given in the *Illustrations*, pl. 83. It is also according to PERRAULT the proper denomination of the tablet seen in the external and internal decorations of the Italian and French schools of architecture, which consists of a border of moldings or other ornaments surrounding a ground occupied by foliage, cyphers, inscriptions, heraldic devices, or even by figures; for *cartouche* is the technical appellation of the ornamental border to the title of a drawing or a print, and *cartel* is the diminutive. 25.

CARTOUCHE is also the term for the frame or border line inclosing and distinguishing the hieroglyphic letters and names of deities and princes in Egyptian architecture.

CARTWRIGHT (....) built, 1682-3, the church of S. Antholin, Budge-row, Watling-street, London, from the design of Wren, which he appears to have materially altered in execution. The plan is ingeniously fitted to an irregular site; CLAYTON, *Churches of Wren*, fol., London, 1849-52. 2.

**CARUCRU** or **CHICA**. A pigment of a rich morone colour, procured from a South American species of *BIGNONIA*. It resembles morone lake in colour, and is equal in body and transparency to the carmine made from cochineal; but the colour flies by exposure to the light, even of a clouded day. 9.

**CARVALHO** (. . . .) The most distinguished architects of this name will be mentioned under their full title of *SANTOS DE CARVALHO Y NEGREIROS*; those of minor importance were *PEDRO de Carvalho*, who was obtained in 1551, from the service of the queen, to finish the works at the convent of *Madre de Deos* in Lisbon; *ONOFRIO* or *Inofrio de Carvalho*, sent 1557-78 to Ormuz; and *JOSÉ MONTEIRO de Carvalho*, architect to the council of finance in 1760.

**CARVEL BUILT**. A term applied by shipbuilders and country carpenters to planking, when the edges of the boards join, or butt against each other; when the edges lap, the work is said to be clinker built. *Carvelle* is the French name of a nail four lines square and as many inches long with a square head. This word is sometimes written *carnele*. 40.

**CARVER**. The name given to a maker of figures and ornaments in wood or ivory. The *BUILDER Journal*, vi, 345, enters at some length on the arbitrary use of the terms "carver, chaser, sculptor, and statuary."

**CARVING**. The act of shaping wood or ivory into objects by means of proper tools. The woods preferred for carving by the ancients were sycamore (in Egypt), cedar, citron, cypress, beech, poplar, fig, myrtle, olive, palm, pine, and some others, besides those which have been retained in modern use, as oak and box, to which ebony, pine, lime, maple, pear, walnut, and the treasures of the cabinet-maker have been added.

**CARVINGS** executed in lime-tree wood, when reduced by the worm to a mass of honeycomb fibre, have been strengthened and preserved by saturating them with a strong solution of corrosive sublimate to destroy the worm; strength was then given by injecting gum and gelatine, and the natural colour of the wood restored by a chemical process: the white vegetable bloom found on the surface or skin of old carvings assists in completing the work of destruction; W. G. Rogers in remarks made at Royal Inst. of Brit. Architects, 17 Dec. 1855, and enlarged upon in scientific journals April 1856.

Another method, described by Henry Crace at the same society, April 28, 1856, applied to carvings worm-eaten in parts into perfect dust, consists in first washing them; then with a gimblet boring a number of holes in the back and into every projecting piece of fruit and leaves in the face, and placing the whole in a trough sufficiently deep to allow it to be well covered by the following solution, namely, 16 gallons of linseed oil, 2 lbs. of litharge finely ground, 1 lb. of camphor, and 2 lbs. of red lead, boiled together for six hours, keeping it well stirred; 6 lbs. of beeswax having been dissolved in a gallon of spirits of turpentine is to be mixed thoroughly with the other while warm. The carving remains in this solution for twenty-four hours; when taken out the face is kept downwards that the oil in the holes may soak down to the face of the carving, and on cutting some of the wood nearly 9 inches deep, it was found to have soaked through. The dust was not blown out, because as it became saturated with the oil it increases in bulk, and renders perfectly solid the carving, being expected in five years to become as hard as any wood, and in twenty years as hard as common putty at the same period. The main stem of those treated was of deal, which had suffered more than the portions of lime, which itself was not so perfect as the oak. One portion of pear-tree had not been touched by the insect at all.

**CARVER'S TOOLS**. These consist of three sorts of *chisels*, some being flat; others with a half-square end, called *V tools*; and the majority with a half-round end, called *gouges*. A *mallet* is sometimes used, but pressure or a blow with the hand is preferable. The surface of the material is cleaned with sand-paper of different qualities, or by pumice-stone, and various sorts of *POLISH* can be given. 14.

ARCH. PUB. SOC.

The so-called **PATENT WOODCARVING**, a process adopted by Messrs. A. S. Braithwaite and Co. in 1840, is accomplished by burning the wood away by means of a red hot cast-iron die or mould forming the pattern, pressed with a power of from 10 to 30 tons, according to the depth required, against the wood which has been steeped in water for about two hours, thereby preventing it igniting; the process is continued until sufficient depth is obtained. A hard brush removes the charcoal, and leaves the wood a pale or deep brown if required to match old work, but a little scraping removes the discoloured surface. Perforated carvings are burned upon thick blocks of wood, and cut off with the circular saw. After 250 impressions the mould requires chasing; 400 to 500 impressions can be obtained from one mould. This method is considerably cheaper than ordinary carving, and the more so the greater the complexity of the design. All undercutting must be done by hand. The process was given up in 1855 for want of patronage.

The **WOOD AND STONE CARVING MACHINE**, patented by William Irving 25 Nov. 1843 and 10 Feb. 1845, and carried out by J. Pratt, for carving elaborate foliated tracery, crockets, finials, etc., is effected by drills of various shapes revolving rapidly in a vertical position. The extremities of the drills are serrated, so as to cut through the material which is guided for the form required. In ornamental work much has to be done by hand after the mechanical operation; in panelling, however, little more is required than to retouch some of the acuter angles. The detailed operation is given in the *CIVIL ENGINEER Journal*, viii, 121, wherein some works executed are referred to; and illustrations given in x, 65.

Another patent, granted to Thomas B. Jordan, 2 Nov. 1844 and 17 Feb. 1845, carries out the same object by somewhat similar means.

**CARYA**, the hickory, a genus of North American trees. The wood is coarse grained, very heavy, exceedingly tough and strong, and is of a red colour at the heart; it decays quickly when exposed to the weather and is subject to be attacked by worms. It is used for cogs, chair backs, large screws, hoops for casks and similar purposes, and is most valuable for hand-spikes; it is considered the best wood for fuel, but crackles and scatters its sparks. *C. alba* sometimes exceeds 3 ft. in diameter; the wood is stronger and better than that of any other kind of hickory. 14.

**CARYATIDE**. Although this term is used indiscriminately by esteemed writers to express the sculptured representation of a human figure of either sex, used instead of a pillar as the support of a cornice, yet the term can only be properly applied to female figures called *coræ*, under which term all varieties of that class will come. The attempt of Gwilt, *Cursory View of the Origin of Caryatides*, 8vo., London, 1822, to set aside the authority of a passage in *VITRUVIUS*, i, 1, has been followed by SMITH, *Dict. of Geography*, s. v. *Carya*, but there is little doubt of the correctness of that passage, as regards the origin of the (*PERSÆ*) male Persian figures and as to the town of *Caryæ* being demolished 477-466 B.C., while the *Caryatide* figures of the *Erechtheion* at Athens can probably not claim an older date than 445-408 B.C., and the best argument against the veracity of *VITRUVIUS* depends upon two uncertain bases, viz., whether *Bathyycles* the sculptor worked at Sparta about 540-530 B.C., and whether in that case the throne of *Amycles* executed by him was actually supported, and not merely decorated, by female figures.

**CARYOCAR** or **CARYOTA TOMENTOSUM** or **PEKEA TUBERCULOSA**, the *saouari*, or *sevarri*. A coarse, opengrained, hard, heavy wood, from the districts of the river Essequibo in British Guiana. It greatly resembles the *mora*, being excellent for ship building, mill timbers, and planking, and can be obtained from 16 to 20 ins. square, and from 20 to 40 ft. long. 71.

**CARYSTIAN MARBLE** was one of the four marbles most valued by the Romans; *CAPITOLINUS*, *Gordian* iii. Two sorts however appear to have been known by this name, as two loca-



lities are pointed out for the quarries and two descriptions are given of the stone. The first in reputation, and perhaps the earliest employed, was a sea-green marble with white veins, as far as can be implied from the authorities quoted by CARYOPHILUS, *de Antiquis Marmoribus*, 4to., Utrecht, 1743, p. 19. The other is the white marble with sea-green veins, now called by the Italians cipollino, which was used in many edifices at Rome, especially for the monolithic columns, 45 ft. high, of the Corinthian order, to the temple of Antoninus and Faustina.

The quarries existed at Marmoreum, a place on the coast of Eubœa, near Carystos, according to STRABO, *R. G.*, x; but on Mount Ocha, according to STEPHANUS BYZANTINUS, *de Urbibus*; and seven columns, 13 ft. long and 4 ft. 3 ins. in circumference at base, complete except the final polish and ready for removal, were seen in their quarry by the side of the road from Carystos up Mount Ocha, and about three miles from the coast, by Mr. Hawkins, according to his account in WALPOLE, *Travels*, 4to., London, 1820, p. 288.

CARYSTOS. The ancient name of a city situated at the foot of Mount Ocha and the shore of the Island of Eubœa. The present Carysto is the seat of a bishopric, but has nothing of architectural interest except the building, apparently belonging to a very early period, called a temple by its discoverer, Mr. Hawkins, and described with an illustration in WALPOLE, *Travels*, 4to., London, 1820, p. 288-90. The monument is a single chamber about 30 ft. 6 ins. long by 16 ft. wide, with walls about 4 ft. thick. The west front, one of the longer sides, had a central door, 7 ft. high and 3 ft. 10 ins. wide at the top, between two windows 2 ft. 6 ins. high and 1 ft. 6 ins. wide at the sill, and 1 ft. 3 ins. at the top; all the apertures have sloping jambs: the masonry is in courses, but some of the upright joints are not perpendicular. The roof appears to have consisted of an unique covering by means of three courses of stones, corbelling inwards from the east wall, leaving a space of about two feet between them and similar ones resting on the west wall; this space may have been covered with a ridge stone sloped both ways; the roof slabs incline so as to throw off the rain.

CASA. A Latin term used for a bower or arbour, TRULLUS, *El.* ii, 1; for a hut, VEGETIUS, *R. M.*, ii, 10; for a cabin or cottage, VITRUVIUS, ii, 1; and for a small country house, MARTIAL, *Ep.*, vi, 43. The Italians have retained the word, but have applied it to a town-house that does not belong to a noble family; they sometimes use the plural "case" for a palace; and provincially the word *ca* is used at Venice and elsewhere to mean the same thing. In Spain, however, the *casas solares* are the family houses of the nobility.

CASALE, or CASAL MONFERRATO. A city in Piedmont, in the Sardinian States. The castle of the citadel, built 1590, has survived the other fortifications, and is now called the palace; the cathedral, dedicated to S. Evasio, is a Lombard edifice, repaired and decorated in 1706; the church of S. Domenico, 1469-1513, is said to be the work of Bramante Lazzari; that of S. Ambrogio is in the same style: the *torre del grand orologio*, built before 1000, was altered 1510: Lazzari is also said to have designed the portal and porticos of the palazzo, once Blandrate, but *della città* since its confiscation: besides these the chief buildings are those of a church, several monastic establishments, two *seminarii*, several palazzi, a theatre, two hospitals, and a granary. 14. 28. 50. 96.

CASAN, see KAZAN.

CASE. An abbreviation of CAGE, of CARCASS, and of CAST.

CASE or CASING. The term given by carpenters to the solid frame of a door or window; and by joiners, to the wooden covering (Fr. *boîte*) of a pillar, a girder, or a pipe; BOX LINING.

CASEBAY. The space between a pair of principals in a roof, or of girders in naked flooring: when one end of a purlin or a joist rests on a wall and the other on a principal or a girder, the space occupied is called a tailbay. GWILT, *Dict.*, calls the *joists* in these spaces respectively "casebags" and "tailbags."

CASED FRAME. A sash frame having the sides hollow, so as to conceal the weights by which the sashes are hung.

CASE HARDENING. The process by which the surfaces of soft iron are converted into a species of imperfect steel, sufficiently hard to resist the action of an ordinary file. It is effected by heating the iron in a closed vessel, in contact with any animal or vegetable substances, whose slow combustion will furnish the carbon required for the formation of the carburet, or else with prussiate (ferrocyanate) of potash, and then, in either case, when the metal has cooled to a dull redness, it is immersed in cold water. The time during which this cementation is carried on is only sufficient to allow of the formation of the surface into steel; so that the malleability of the iron is retained in the body of the piece operated upon whilst the surface is hardened. MUSHET, *Papers on Iron and Steel*, 8vo., London, 1840.

G. R. B.

CASELLA (DANIELE), a Lombard by birth, studied under Taddeo Carlone at Genoa, where the master resigned to the pupil the modernization of the church of S. Pietro di Banchi. Daniele also designed the first chapel in the right hand aisle of S. Siro, and many other works in that city: he was also employed at Castel Gandolfo. 37.

CASEMATE or CASEMENT MOLDING. A name for a cavetto, being a concave molding from one-fourth to one-sixth of a circle in section; it is also wrongly applied to a scotia. 2.

CASEMENT. A frame of wrought or cast iron for the glass of a window, hung to masonry by hinges affixed to one of its styles. For wooden casements, see FRENCH WINDOW.

CASERTA. The name of a city and a province of Terra di Lavoro, in the kingdom of Naples. Caserta Vecchia, surrounded by bastioned walls, which are said to date from the eight century, contains a very old, sumptuous, and handsome cathedral dedicated to S. Michele, several churches, four monasteries, a convent, and a seminario. Two miles distant from it is Caserta Nuova, which, besides several churches, a good piazza, a convent, an hospital, a military school and spacious barracks, contains the royal palace called the *Castello*, commenced in 1752 for Carlo VII, by Vanvitelli, and built of travertine stone from S. Iorio, near Capua. It is a rectangular building nearly facing the cardinal points, of four stories in height, with thirty-seven windows in each story, the south front being about 780 ft. long and 125 ft. high. The vestibule and grand staircase, the theatre on the ground floor, and the chapel on the first floor, are the noblest portions of the interior as regards their decoration. The palace was completed by Ferdinand IV at the same time with the aqueduct, twenty-one miles in length, also constructed by Vanvitelli; this last work, carrying water from Airola and Fizzo (the source of the Aqua Julia of Capua) on the skirts of Monte Taburno, runs in a channel, sometimes tunnelled and at others carried upon arches; the largest aqueduct-bridge is at the ponte della Valle, or ponte Madaloni (or Maddaloni), rising with three tiers respectively of nineteen, twenty-eight, and forty-three arches, to a height of 190 ft., and being 1820 ft. long on the top. The water which remains after the palace and gardens are supplied, is united to that of Carmignano for the benefit of the capital. Good views of the ponte Madaloni and the palace are given in the *Voyage pittoresque de Rome à Naples*, fol., Naples, 1823; and the building itself is illustrated fully in the *Dichiarazione dei Disegni del real palazzo*, fol., Naples, 1756. *Detached Essay*, AQUEDUCT, pl. 2; SAINT NON, *Voy. Pitt.*, fol., Paris, 1781, ii, 261. There is also a description of this palace, etc., in a *Life of Vanvitelli*, published by his brother.

CASE TO STAIRS, see CAGE.

CASHEL. A city in the county of Tipperary. On an isolated limestone rock close to the town are placed the principal architectural remains, the most interesting ancient works in Ireland, which are surrounded by a wall formerly embattled and flanked by towers, giving them the character of a fortress. They consist of 1, the *round tower*, standing at the north-east

corner of the north transept of the cathedral. A door from the transept leads by a narrow passage in the gable wall into the tower, which is 9 ft. 6 ins. internal diameter, the walls being 4 ft. thick at the base. The doorway, 12 ft. from the ground, has a semicircular head; there are four windows in the upper story on one level, triangular headed with converging jambs; three square headed windows with converging jambs are placed in the intermediate stories. The height to the eaves is 82 ft., and that of the conical stone roof, which is in a perfect condition, is 11 ft. 6 ins. The sandstone is hammer-dressed in nearly regular courses from 7 to 13 ins. in height; a few blocks of limestone occur in the lower courses.

2. *Cormac's chapel*, now used as a chapter house, stands in the angle formed by the choir and south transept (into which there is a door) of the cathedral. It was erected 1127 by Cormac McCarthy, king of Munster, and was consecrated 1134. It consists of a nave and chancel with two square towers at the east end of the nave.



The nave is 28 ft. long by 18 ft. wide, with a semicylindrical vault; the chancel is 12 ft. 6 ins. long by 12 ft. wide, with a semicircular groined vault having ribs springing from the angles. The total height outside is 52 ft., the roof slanting 24 ft.; mean thickness of walls 4 ft. 1 in. Both are roofed with stone after that form peculiar to the early churches of Ireland before the Norman invasion, c. 1172; the exterior casing is of sandstone ashlar, each course overlaying the preceding one; the interior lining, which forms a pointed arch, consists of blocks of calc tufa; the roof being of a very high pitch, there is an apartment over the nave and chancel, between the vaulting and the roof. The floor of that over the former is nearly 6 ft. higher than that over the chancel, access to which is obtained by a doorway in the east gable wall, with a flight of steps down. This is lit by two circular openings in the east wall, about 1 ft. in diameter externally, with large inward splays. The larger apartment has two circular-headed openings in the east gable, two modern square windows in the south side of the roof, and an original fireplace at the west end, with several hot air flues in the wall traversing the apartment close to the floor. The north and south walls of the interior of the nave are ornamented with semicircular-headed arcades divided by square pilasters which rest on a plinth without bases; their caps are a square abacus with a billet ornament under; their surfaces are covered with incised ornaments composed of a variety of interlaced work, frets, lozenges, etc., the arches consisting of incised chevrons. The upper part is recessed, and has engaged columns over the pilasters before mentioned; their caps are sculptured, the bases are molded, and some are sculptured; broad square bands springing from the caps divide the vaulted ceiling into compartments. The south door has a semicircular arch of three orders enriched with chevrons and an indented square; on the tympanum is sculptured a grotesque animal. The north door is of five orders enriched with sculpture, the caps carved with animals and human heads; the tympanum exhibits a centaur with a conical helmet, with bow and arrows shooting at a nondescript animal. The chancel arch, not in the centre of the nave, is of four orders, profusely sculptured with

ARCH. PUB. SOC.

chevrons and human heads; some of the jamb shafts are fluted spirally; from unequal pressure the arch has assumed a horse-shoe shape. The walls of the chancel are of a richer character than those of the nave. There is not an east window, but a high arched recess in the wall projecting externally is ornamented internally with an arcade over the altar, the columns being enriched with incised ornaments; over the arcade is a string with a billet molding and sculptured heads. The walls and ceilings were originally painted; the colours chiefly used appear to have been reds, yellows, and whites. Doors from the nave lead into both towers; the north one is 51 ft. high to the apex of its pyramidal roof, which is of a singular form. The south tower is 55 ft. 9 ins. high, and has seven string-courses; one of its stories is arcaded on three sides; it has a spiral staircase up to the apartments described, and no roof. The south side of the nave on the exterior is divided into four stories in height, the upper two of which are arcaded, with columns, strings, and a variety of sculptured ornament. The south wall of the chancel has one arcade, the columns are destroyed.

3. The *cathedral* consists of the remains of a nave, chancel, and transepts, all without aisles, with two small chapels to each transept, a large central tower, and of a massive western tower, which was a later addition. Although the edifice was commenced before 1172, the greater part of it is of the thirteenth century. The entire length is 180 ft. and 170 ft. wide; the nave is only 43 ft. long, while the chancel is nearly 90 ft.; both were unroofed in 1752. In one of the transepts is a large and massive stone sarcophagus, stated by tradition to be that of Cormac Mac Cullenan, king of Munster and bishop of Cashel in the ninth and early part of the tenth centuries; the sides are sculptured with intertwining snakes and interlaced ornamentation.

4. Adjoining this building are remains of the vicars' hall, founded 1419; the deanery, forming part of the monastery founded about 1260; and the old episcopal palace at the west-end of the cathedral.

In the city, which is small and irregularly built, with a scanty supply of water, are remains of the Franciscan friary called Hackets Abbey, founded in the thirteenth century; of the Dominican friary, founded 1243, but rebuilt 1480; and of Hore Abbey for Benedictines, founded 1172 and made Cistercian 1269, when the abbey was rebuilt. The new cathedral, built about 1750, by archbishop Agar; the Roman Catholic chapel about 1770; the archbishop's palace at the foot of the rock; good infantry barracks for two companies; a nunnery; a Wesleyan chapel; a bridewell; an infirmary; and a market and court houses, comprise the other buildings of importance.

FRASER, *Guide*, 8vo., Dublin, 1844; WATKINSON, *Survey in South of Ireland*, 8vo., London, 1778; GROSE, *Antiq.*, 4to., London, 1791; LEDWICH, *Antiq.*, 4to., Dublin, 1790; HALL, *Ireland*, etc., 8vo., London, 1841; PETRIE, *Eccles. Arch.*, 2nd edit., 8vo., Dublin, 1852; WILKINSON, *Geology*, etc., 8vo., London, 1845; the *Journal of the ARCHEOLOGICAL INSTITUTE*, ii, 121, illustrates the cross-legged effigies, male and female, now built into the grave-yard wall of S. John's church. R. R. B.

CASING OF TIMBER WORK, see CAST or CASTING.

CASINO. The Italian name used at first for a small house, afterwards for a pleasure house in a garden, and then for a place of relaxation in a town. It is still applied in the second of these senses, as at Corditella near Naples, which is a royal farm, and in the case of buildings like the casino of the villa Aldobrandini at Frascati, of the palazzo pontificale on Monte Cavallo, of the villa del papa Giulio, and the palazzo (of that villa) now the casino della reverenda camera, and of the villa Borghese in the environs of Rome. But the term has acquired an European acceptance in the sense of a place of recreation; such as the casino or club at Macerata, at Perugia, and at Milan; like that at Frankfort, containing reading, conversation, dining, coffee, billiard, card, and ball rooms; one of the best of the class is that at Ghent, 320 ft. long, erected, 1835, for the So-



cieties of Arts and of Horticulture by Roelandts, illustrated in WAUTERS, *Délices de la Belgique*, 8vo., Brussels, 1846, p. 170, and in the ILLUSTRATED LONDON NEWS *Journal*, iii, 212; another at Copenhagen is given in the BAUZEITUNG *Journal* for 1850, pl. 309; and in the same work for 1846 are plans and a view of Kroll's garten or casino (burnt) at Berlin.

CASINUM and MONTE CASSINO, see GERMANO (SAN).

CASOLI (LUIGI MARIA), was born 1659, and built at Bologna in 1706, of the Corinthian order, the church of Sta. Maria della Purificazione, also called della Mascarella; the ospedale grande in that city, 1667-1725, is attributed by some authors to Bonifazio Sochi, by others to Casoli who died in 1739. 105.

CASONI, CASSIONE, or CASSONE (ANTONIO), was born about 1559 at Ancona, educated at Bologna, and erected at Rome the church of the Padri Cappucini, sometimes attributed to the padre Michele; that of S. Isidoro (1622) and the monastery of the Padri Irlandesi, both on Monte Pincio; restored and modernized the monasteries of the Padri di S. Marcello facing the Corso; that of S. Agostino with its portal in the street which joins the Scrofa to S. Luigi; the convent of the sisters of Sta. Lucia in Selice; the church of Sta. Maria della Concezione; and was employed by the duca de Bracciano at Rome, as in the case of the fountain in front of the palazzo at Monte Giordano (illustrated in FALDA, *Fontane*, pl. 20), and on his estates; as well as by many private individuals in Italy, and by the count Altemps, archbishop of Salzburg, to whom he forwarded many designs. He died in January 1634. 5. 12. 28. 30. 38.

CASSABA, see BASILICA.

CASSANDRO of Rome, and Florin de Pituenga, were engaged in 1090 to superintend the eight hundred artificers employed to rebuild the city of AVILA DEL REY in Spain, according to ARIZ, *Historia, etc., de Avila*, fol., Alcala, 1607; doubted by RISCO, *Espana Sagrada*, xxxviii, 134.

CASSANO, a city in Calabria Citra in the kingdom of Naples, built in the recess of a steep mountain, contains a dilapidated castle, a majestic cathedral dedicated to the nativity of the Virgin, and some monastic establishments. 50. 96.

CASSAU, in Hungary, see KASSAW.

CASSEL. The capital of the duchy of Hesse Cassel in Germany. It is divided into the old, the upper and the lower new towns, with the Wilhelmshöhe, Frankfurt, and Leipzig suburbs; a stone bridge of three arches, 258 ft. long, crosses the river Fulda. The museum and its contents deserve special notice: among them is a collection of five hundred European woods. The church of S. Martin (in the style *ogival secondaire* and later), with the tomb of Philip the Magnanimous, 1567, in the place usually occupied by the high altar; six other churches; a synagogue, given in the BAUZEITUNG *Journal* for 1840, pl. 349; the electoral palace; the foundations and ground-floor of the Kattenburg, a second palace commenced 1820 and stopped in the following year; the orangery; the theatre; the marble bath in the public garden; the könig's-platz, a crescent giving a six-fold echo; the old town-hall; the government buildings at the castle now a prison; the mint; the arsenal; and the barracks, now a poor house, are the chief features of the town, besides three schools, four prisons, and eight hospitals and asylums. Three miles distant is Wilhelmshöhe, the electoral summer palace, of which the main features are the theatre; the fountain, with a jet of 12 in. in diameter and 190 ft. in height; the new cascade, 130 ft. high; the Löwenburg, an imitation of a mediæval castle; and the old cascade of 900 steps, rising to an octagon temple, surmounted by a pyramidal base to the colossal statue of Hercules, 30 ft. high, of beaten copper. GUERNIERI, *Disegno del monte—la Cassa del Inverno, ora Carolino*, fol., Cassel, 1706. 28. 50.

CASSEL EARTH, corruptly called castle earth. An ochrous pigment, of a fine semitransparent brown colour, inclining to russet. 9.

CASSHE PECE, in the indenture for building Eton College, as given by BRITTON, *Arch. Antiq.*, ii, 89, is explained to be a mistake for casement-piece by WILLIS, *Arch. Nomenclature*, 4to., Cambridge, 1844, p. 28.

CASSIA FISTULA. A vegetable pigment imported from the East and West Indies. It is only used in water, as a substitute for bistre, being of a deep transparent colour, between citrine and dark green. 9.

CASSIONE or CASSONE, see CASONI (ANTONIO).

CASSOON, properly CAISSON.

CASSELLS (RICHARD), born in Germany, was invited to Ireland by Sir Gustavus Hume of Castle Hume, co. Fermanagh. He commenced with Castle Hume, followed by Hazlewood (now Mr. Wynne's) in county Sligo; Powerscourt in county Wicklow; Carton (belonging to the duke of Leinster) in county Kildare; and Besborough in county Kilkenny. In the city of Dublin he erected for the marquis of Waterford a house, now the National Society's School, in Marlborough-street; Leinster House about 1745, now the Royal Dublin Society, in Kildare-street; lord Bective's house in Smithfield (the front only remains); and several private houses in Sackville-street, Stephen's-green, and other parts of the city; the Lying-in Hospital, 1751-57, in Great Britain-street, which cost £20,000 with the attached Rotunda (not the new rooms); the building is illustrated in MALTON, *Picturesque, etc., Views of Dublin*, fol., London, 1794. The Parliament House, costing £40,000 (the east portion was by Gandon and the west by Parke), is said to have been designed by him, but HARRIS, *History*, 8vo., 1766, p. 410, mentions that it was executed 1729-39 under the inspection of Sir Edward Lovet Pearce and Arthur Dobbs, esquire, but whether from their designs or from that of Castell or Cassels (for the name is written both ways) or any other architect is not stated. The merit of being the first architect that ever built a stone lock in Ireland was given to him when engaged upon the Newry canal. He died at sixty years of age and was buried at Maynooth. WARBURTON, *Hist. of Dublin*, 4to., Lond., 1818.

CASSOPE, a city at a short distance from the sea on the road between Pandosia and Nicopolis in Epirus, near the present village of Kamarina. The ruins are described by LEAKE, *Northern Greece*, 8vo., London, 1835, i, 247, as among the most extensive in Greece; the walls of the Acropolis may be traced round a level site about 3000 ft. in length; and enough remains of those of the city to show that they were about three miles in circuit. At the western foot of the Acropolis is a tolerably well preserved theatre, 50 ft. in diameter, and near to it the Vasilospito, or king's tomb, which is a subterranean chamber 9 ft. 9 ins. square, having a curved roof with 5 ft. 7 ins. rise, and is approached by a passage 19 ft. long and 5 ft. wide, having a curved roof with 1 ft. 6 ins. rise: these roofs are hollowed out of corbelled horizontal courses of stone. There are several antique tombs between the ruins and Kamarina.

CAST. A small brass funnel used by plumbers for conducting melted lead to any point of their work. BELL-CAST. 2.

CASTANEA, the chestnut. (It. *castagno*; Sp. *castano*; Fr. *châtaignier*; Ger. *castanienbaum*.) A deciduous tree of considerable size, those of Europe having a mean height of 44 ft. and diameter of 37 ins. It is a native of Castanea in Thessaly, where magnificent specimens are still found. ÆSCULUS. CALO-DENDRON. PENNY MAGAZINE, xii, 483.

C. vesca, sweet or Spanish chestnut, of Europe and America. The wood is so much like oak, that timber employed in the old buildings of England are generally reported to be chestnut, but the QUERCUS sessiliflora is now considered to have been used for such purposes. The chestnut being strong, elastic, and enduring the succession of dryness and moisture, is useful for mill timber and water works: also for posts, which should be made of trees less than 10 ins. diameter, and charred; rails are said to last upwards of fifty years. For shingles it is considered superior to oak, though it also warps. It makes good hoops, as it resists the dry rot in cellars where other woods will decay. The old wood is considered brittle.

C. pumila, *chiucapin*, of Maryland, Virginia, and the Floridas, though a

tree of less size, gives a wood of finer grain, and is more compact, heavier, and perhaps more durable than the above.

*C. tribuloides* (colour, *chisee*, *makoo shingali*) of Nepal and Gualpara, East Indies, forms a hard, heavy, and tough timber. 71.

CATANEDA (JUAN DE), was architect with Vallejo at the rebuilding of the transept of the cathedral at Burgos 1539-67.

CASTELARAGONESE, see CASTEL SARDO.

CASTEL D'ASSO, or CASTELLACCIO, see AXIA.

CASTELL (RICHARD), see CASSELS.

CASTELL (ROBERT), published *Villas of the Ancients Illustrated*, fol., London, 1728. The treatment received by him, while confined in the Fleet prison, which caused his death in 1729, is detailed by SMITH, *Antiquarian Rambles*, 8vo., London, 1846, ii, 99-103.

CASTELL, or CASTYLL (THOMAS), prior of Durham 1494-1519, rebuilt the east gates of the abbey with the porter's lodge and over them the chapel of S. Helen with its priest's chamber, and restored (after the plan of his predecessor, prior Forcer, according to the SURTES SOCIETY, *Sanctuary*, 8vo., London, 1837, p. 215) the north window in the mid-angle of the cross of the cathedral. His epitaph on a stone before the altar is given by WHARTON, *Anglia Sacra*, fol., London, 1691, i, 781, who, p. 767, calls his predecessor Fossor.

CASTELLAMARE. A seaport city in the province and kingdom of Naples. Besides the cathedral dedicated to the Assumption of the Virgin, there are five churches, a monastery, and a convent, a royal residence, a good barrack, an hospital, a *seminario*, and the villas and casini on the hill called Quisisana. 28.

CASTELLAMONTE (IL CONTE AMEDEO DI), designed for Carlo Emanuele II duke of Savoy, 1638-75, the royal palace at Turin; and the hunting seat, or rather village, a description of which he published in the form of a dialogue with Bernini, under the title of *Venaria reale*, fol., Turin, 1674. 28.

CASTELLANETA. A city in the province of Terra di Otranto in the kingdom of Naples. It contains an ancient cathedral dedicated to S. Niccolo, some monasteries, and an hospital. 96.

CASTELLI (FRANCESCO), not Cappello as written by CIGNARA, occurs in the list of architects to the cathedral at Milan under the date of September 1658, and his competition design for the façade is still preserved there. 27.

CASTELLO (AGOSTINO), was engaged 1524-35 in designing and making the model for the new cathedral proposed to be erected at Brescia, as shown at length by ZAMBONI, *Memorie*, fol., Brescia, 1778, pp. 56, 120, 127.

CASTELLO (DOMENICO), a pupil of Carlo Maderno and of Bernini, directed the works designed by the former at the Barberini palace for the prince of Palestrina; was employed to restore the church of S. Lorenzo in Fonte at Rome; and (after Maderno 1629, and B. Breccioli, 1637), upon the buildings erected at Castel-Gandolfo by pope Urban VIII (1623-44); rebuilt in 1636 the façade of Sta. Anastasia *sub Palatio* at Rome, illustrated by CRESCIMBENI, *Istoria*, 4to., Rome, 1722; CAPELLO, *Brevi Notizie, etc., della Chiesa*, 12mo., Rome, 1722, cites TITI, *Nuovo Studio*, 12mo., Rome, 1708 (the latter author, however, in the edition of 1763 states that this façade was the work of Luigi Arrigucci); and rebuilt, 1660, S. Girolamo della Carità at Rome. 12. 28. 96.

CASTELLO (GIOVANNI BATTISTA), called IL BERGAMASCO; studied at Genoa and Rome, and is said to have been a pupil of M. A. Buonarroti; he returned to Genoa about 1558 and executed the portal and other works at the palazzo Imperiale, in the piazza Campetto; entirely modernised about 1560 the church of S. Matteo, built 1278; designed the interior of the chapel of the S. Sacramento in S. Lorenzo; erected about 1580 in the *Strada Nuova* the palazzo Pallavicino, afterwards Carega, now Cataldi; and according to GAUTHIER, *Gènes*, fol., Paris, 1830, ii, 50, is said to have erected for the Vivaldi family the villa dell' Albergo d'Oro, afterwards belonging to the Imperiali, in the val di Bisagno. He went in 1562 (1567 in NAGLER, he

fled in 1576 according to SOPRANI) to Spain, where, 15 November, 1564, he commenced the palace called el Viso for the marquess of Sta. Cruz in the town of that name; designed the principal staircase from the palace to the church of the Escorial; and replaced in 1567 Juan de Herrera as successor to Juan Bautista de Toledo, *arquitecto mayor* to the royal works. He died at Madrid in 1570 according to PALOMINO, *Museo*, fol., Madrid, 1715, ii, 243; in August 1569, LLAGUNO; SOPRANI says aged seventy years and more in 1579, but the age is made eighty years by ORLANDI. 3. 37. 66. 68.

CASTELLO (MATTEO DA, or MATTEO DA CITTA DI), commenced in 1585 the acquedotto Felice, but failed, and was superseded in the same year by Fontana; CASSIO, *Corse dell' Acque*, 4to., Rome, 1756, i, 313; in 1592 he made designs for the church and monastery of Sta. Maria della Scala at Rome; the former was built up to the cornice by F. da Volterra, and finished with the façade by O. Mascheroni. TITI, *Ammaestramento*, 8vo., Rome, 1763. 68. 96.

CASTELLOBRANCO. A city in the province of Beira in Portugal. A half-ruined castle, a modern cathedral dedicated to S. Michael, two churches, an episcopal palace, two hospitals, and a richly endowed poorhouse, are the only buildings deserving notice, except two monasteries outside the ancient walls. 28. 96.

CASTELLUM. This term is frequently used by Latin writers for a small fortified town, or a fort surrounded by a village, but it properly meant a small camp, being the diminutive of *castrum*. HORSLEY, *Britannia Romana*, fol., London, 1732, p. 108, applies the term to one of the three kinds of fortification adopted in the walls of Severus; the other two being denominated stations and towns: these castella were thick and lofty walls enclosing a space 66 ft. square, placed at intervals of seven furlongs between the stations, but the towns were much smaller. VITRUVIUS, ix, 9, uses the word for a cistern, and viii, 7, to denominate a reservoir of water in the course or at the extremity of an AQUEDUCT, as shewn in *Detached Essay*, p. 7. CONDUIR.

CASTEL PATERNO, see PATERNO CASTELLO.

CASTEL SARDO, also called CASTELARAGONESE. A city in the island of Sardinia. The only buildings of importance are a cathedral dedicated to S. Antonio and an hospital. 96.

CASTEL SEPRIO (TAVANINO DA), occurs in the list of architects to the cathedral at Milan under the date 9 July 1388. 27.

CASTERTON STONE. A freestone obtained from quarries at Little Casterton, twelve furlongs from Stamford in Lincolnshire. The colour resembles that of Ketton or of Bath stone. The texture is fine, and blocks of any portable size can be obtained from beds 4 ft. and upwards in thickness. It has been used at Kettering, Stamford, and neighbouring workhouses, 1836-7; Peterborough gaol, 1840; the railway stations from Peterborough to Wellingborough inclusive; Benefield church entirely built of it, 1845; in restorations at Ely cathedral, and at Boston church, and lately at the Lynn, the Downham Market, and other cemeteries. *BUILDER Journal*, May 31, 1856.

CASILHO (JOÃO DE) was *fidalg* da casa real, and in 1519 undertook the construction of the sacristy and library at Alcobaça as *maestro das obras reales*; in 1522 he was engaged in the same capacity at Belem; in 1528 he succeeded the maestro Matheos at Batalha. A long list of his works up to 1541 is given in RACZYNSKI, *Diet*, 8vo., Paris, 1847, p. 43, among which are named the monastery at Belem, the palaces at the water-side, the chapel of the monastery of S. Francisco at Lisbon, the foundations of the chapel of the Magazine, the dry docks at the arsenal, and the works at Thomar in the choir, chapter-house, chief entrance, and queen's apartments; in 1542 he designed the fortification of Mazagão; in 1551 was again engaged at Thomar, and died 30 August 1581, aged more than eighty years. He was a *cavalleiro da ordem militar de Christo*; BARBOSA-MACHADO, *Bibliotheca Lusitana*, fol., Lisbon, 1752, i, 235.



CASTILHO (JACO DE), brother of the above named João, succeeded in 1524 to M. Pires as *maestro mayor* of the works at the palace of Coimbra, and with a maestro Nicolao finished the façade of the monastery of Sta. Cruz. His son JERONYMO followed the profession of architecture.

**CASTING.** Objects are said to be *cast*, when the substances, of which they are formed, are introduced in a soft state into a mould in which they harden sufficiently to retain the form of the interior of the mould itself. The term casting is used whether the fluidity of the substance be produced by the addition of water, as in the casting of cement or plaster; or by the application of heat, as in the casting of iron, zinc, or other metals. In the former case solidification results from the crystallization effected by the introduction of water to the pulverulent anhydrous materials; in the latter, simply from the cooling of the mass accompanied by a renewed crystallization. By common usage the word "cast" is applied to the materials, which have been thus run into a mould, *i. e.*, to the result of the operation of "casting", for all materials so used except iron, the phrase for which is "iron castings." **BLAST.** G. R. B.

**CASTING.** The alteration in flatness and straightness which woodwork sometimes undergoes after it is finished, either from defects in uniformity of material, or of dryness, or from the gravity of the material. **WARPING; WINDING.**

**CASTING.** A method of plastering used in old timber houses for filling in between the framing, or post and pan work. It is so called because, instead of being laid on with the ordinary plasterer's trowel, it is thrown or "cast" forcibly against the laths. This work is of two descriptions; *ROUGH cast* (Fr. *crêpe moucheté*; It. *arriciatura*), the material of which is composed of very small rough angular stones mixed with the lime instead of the ordinary sand, and left with a rough face without any attempt at trowelling. The other is brought to a fair face with the trowel, and while wet receives a pattern, either from a sort of scoring with its point, or with a stiff broom; or else a design is made on a piece of wood by driving in a number of pins of iron wire, and this is pressed on the plastering when about half dry. Sometimes very elegant diapers have been executed in this way on old houses, particularly in the south of England. The term casting was formerly given to the external plastering done to a building with mortar lined to imitate jointing. A. A.

**CAST IRON.** (It. *ferro fuso*; Sp. *hierro colado*; Fr. *fer fondu*, *fonte*; Ger. *gusseisen*.) Iron cast or poured when in a fluid state into a mould, either directly from the blast furnaces in the mining districts, or from the cupola furnaces in other localities. Cast iron is a mixture of the pure oxide of the metal with a variable proportion of carbon in an uncombined state; the carbon gives to it a grey tone of variable depth. As the character of this grey tone is an indication of some of the qualities of cast iron, writers upon building materials, especially on the continent, distinguish the varieties by the names of grey, white, or mottled iron, according to the colour. In England, however, another sub-classification exists, and cast iron is occasionally known under the names of foundry Nos. 1, 2, and 3, bright, mottled, and white iron, of which varieties the three first are used for architectural purposes; the bright and the mottled irons for the manufacture of bar iron, whilst the white cast iron is too thick when hot and too brittle when cold for any of the ordinary purposes of art. Cast iron is also distinguished as being of first or second runnings; the first runnings are obtained at once from the ore in the blast furnace, whilst the second runnings are composed of iron which has been melted a second or a third time: on the latter occasions it passes through the cupola furnace.

The process of obtaining iron from the ore, as adopted in England and Wales, is as follows. The raw iron stone or *mine*, as it is called, is roasted or calcined in order to drive off the carbonic acid, water, and sulphur, which are usually in combination with the limestone, clay, and iron forming the basis of

the ore; the loss of weight by this operation is from 20 to 30 per cent. This roasted mine is then melted in the blast furnace with coke and a flux, that is to say, either clay or limestone, according as the raw mine is a calcareous or an argillaceous iron ore. Formerly the **BLAST** was always of cold air, but about the year 1827 a patent was taken out for the use of hot air for this purpose, and, generally speaking, at the present day the air which is forced through the tuyeres is heated to 600° Fahrenheit, the cold blast being only retained in certain foundries where a superior and more expensive description of iron is manufactured. About the same period also a system of mixing clay with the cinder or refuse from the refining or puddling furnace was introduced, which in conjunction with the hot blast, must be considered to have deteriorated the quality of the iron made of late years. However, the furnaces charged with the mine, coke, and flux before mentioned are worked for twelve hours, or a turn as it is called, and are then tapped to allow the metal, which has separated from the scoriæ or cinder, to flow from the hearth into a trough leading to a series of moulds made in the open sand, and known amongst workmen by the names of *sow* and *pigs*, which names are also applied to the iron itself, and it is to the pig iron thus obtained that the classification before given is applied. **SMEETING.**

No. 1 pig iron contains the largest proportion of carbon of all the varieties of the simply prepared forms of that metal. It is soft and very fluid when hot; smooth upon the face; of a large dark open grain; it does not ring when struck, but emits a dull sound like lead; it is tough, indeed almost malleable, and is broken with difficulty by sharp blows. No. 2 pig is not so soft as No. 1; it is closer and finer in the grain, does not indent so easily, and though it be not so tough as No. 1, it resists greater strains. No. 3 is still finer and closer in the grain, and possesses greater powers of resistance than the pig irons previously mentioned, provided the efforts to which it is exposed are not of the nature of sudden shocks; for it is more brittle, and is more susceptible of atmospheric influences. Bright iron is hard and brittle, of a slightly granular fracture, of a lighter colour and brighter lustre than the metals generally used for foundry purposes; whilst the mottled iron is smooth in the fracture with hardly any grain, and is apparently, from its peculiar mottled grey and white colour, composed of two descriptions of metal. White iron is of a silvery white colour, shining and smooth in its fracture, often with a radiated structure; it is very hard and brittle, and when it leaves the furnace it is so viscous as hardly to be run into the moulds for pigs. Singularly enough, the cast irons which resemble wrought iron most closely in their chemical composition, that is to say, the freest from carbon, are precisely the three last-named varieties of pig, which differ the most strongly from the wrought iron in their mechanical properties. Nos. 1 and 2 pig iron are rarely used for first runnings, because their crystallization is of too large a character to adapt them for delicate works, and their want of strength is objectionable for large operations; No. 3 iron is, however, much used for first runnings, and may safely be employed in large plates for foundations or for tanks, columns, etc., whilst it is decidedly preferable to second runnings for ornamental castings. The bright and the mottled irons are occasionally used as first runnings for objects in which hardness is desirable, such as tram-plates; or for those in which brittleness is not an insuperable objection, as for counter weights, etc. Hot blast No. 3 iron it must, however, be observed, should never be used for girders without being melted a second time; and cinder irons require to be remelted for all purposes requiring strength. It is essential that the fuel employed either in the furnaces of the iron works, or in the cupolas of the foundries for second runnings, should be deprived of its sulphur, for the iron has a remarkable affinity for that substance in any of its forms, and is rendered exceedingly brittle by its introduction.

When great strains are to be resisted, or when uniformity of strength and of texture is an essential element in a casting, it is

almost always necessary to remelt cold blast iron, and to adopt a mixture of Nos. 1 and 3 pig; as, for instance, in cylinders for steam engines, large shafts for mills, and teeth wheels. For girders, hot blast pig iron and broken castings, or plate iron as they are called, may be used; but these mixtures require to be made with great care, and cinder iron and burnt metal carefully excluded. J. D. Morris Stirling, by patent 1846, mixed portions of wrought iron with the plate used for second runnings; and it has been stated on very good authority, that the result of this mixture is an increase of strength in the metal to a very marked degree. However the different qualities of iron be thus mixed for second runnings, great care must be taken to ensure the discharge of any air or gas which may be contained in the metal poured into the mould, and the removal of any scoræ or dross which floats upon the surface of the metal in the ladles; for the air bubbles and cinders, as the workmen call those imperfections, are amongst the most serious objections to which cast iron is exposed. It is very rarely that the molders employed at blast furnaces are careful or skilful enough to avoid dangers of this description, and it therefore becomes almost necessary that large castings should be made from second runnings and in town factories. Under any circumstances, however, it is important to observe that when girder castings have to support considerable weights, it is advisable that their length should not exceed the limits within which iron can be poured from one head; because when a casting is so long as to require to be run from two heads, there is much danger of a cold shut at the junction of the streams, as the consequence of the cooling of the metal, from having flowed in contact with the damp sand of the mould. In designing the outlines of any object to be executed in cast iron, it is necessary to render the various portions as uniform in their dimensions as possible, so as to avoid any inequality in the shrinkage; and when girders or other articles intended to support heavy weights are made, it is desirable that they should cool as gradually as possible. A sudden lowering of the temperature of a mass of cast iron interferes with the molecular arrangement of the crystals; and it will be observed that the castings made with a chill present a very different texture from those in which the metal has been allowed to arrange itself slowly: the crystallization is smaller and more condensed, whilst at the same time the metal is harder and more brittle. The term "cast with a chill" itself means either that the metal was poured into a mould able to chill it instantaneously, or that it was abruptly chilled by being immersed in water before it had entirely cooled in the natural way. This process is frequently employed in the arts, and especially for the purpose of hardening the bearing surfaces of bushes, shafts, etc. The best iron founders consider that girders should be left in the sand at least from one to one and a half days from the time of casting.

The tests of the quality of cast iron are afforded by an inspection of the grain, and by its mode of working, or by submitting it to actual strains. The grain and the mode of working, however, can only be considered to indicate the mechanical qualities of the metal, but they should in no wise be considered to take the place of more positive proofs of the soundness of a casting; and it may, indeed, be said that no girder or beam should be used without being proved by exposure to an effort of the same character and intensity as that to which it is habitually to be subjected. For ordinary architectural purposes, the grain of cast iron should be close, fine, free from large crystals, and without any appearance of radiation in the arrangement of the molecules; it should be easily chipped, and yield to the blow of a hammer, and be acted on by an ordinary tempered file. At pp. 103 and 104 of HODKINSON, edition of TREDGOLD, *On the Strength of Cast Iron*, 8vo., London, 1842, will be found some useful remarks upon the modes of distinguishing the properties of cast iron by its fracture. With respect to the dynamical tests, reference may be made to the following works: The Parliamentary Report *On the Applica-*

*tion of Iron to Railway Structures*, 1849; FAIRBAIRN, *On Cast and Wrought Iron*, 8vo., 1854; CLARK, *Britannia and Conway Tubular Bridges*, 8vo., 1850; TATE, *On the Strength of Materials*, 8vo., 1851; and LES ANNALES DES PONTS ET CHAUSSÉES for 1854 and 1855; PHILLIPS, *Metallurgy*, 8vo., 1852; REPORTS OF THE JURIES, 1851. In WEALE'S *Engineers' and Contractors' Pocketbook* for 1854, will be found a valuable synopsis of the present state of science on this subject, with a series of formulæ and tables for calculations as to the various objects to which cast iron is usually applied in building.

Cast iron is also commercially known by the names of *open sand*, *sand*, and *loam* casting, according to the nature of the mould into which the metal is poured. Open sand castings are made by pouring it into moulds in the sand floor of the foundry, without any cover to the upper part: they are easily recognized by the cavernous nature of their exposed surfaces. Ordinary sand castings are obtained by pouring the metal into moulds partly formed in the sand floor, but the upper portion in sand rammed hard into a species of moveable box or flask. Loam castings are obtained from moulds made in a species of plastic loam susceptible of being worked to a finer face than the sand generally used. Counter weights, fire bars, and paving plates, are usually cast in open sand; girders are cast in flasks; whilst pipes, cylinders, etc., are cast in loam, both in foundries for second runnings and furnaces for smelting ore.

The specific gravities of cold blast pig iron vary between 6.955 and 7.159; that of hot blast iron is about 7.017. The modulus of elasticity is stated by FAIRBAIRN to vary between the limits of 11,539,333 (in Ley's No. 1 hot blast) and 22,907,700 (in No. 3 Devon cold blast); but, according to MM. Meygret and Desplaces, the modulus may descend as low as 3,000,000, according to the manner of putting together an arched beam. Cast iron resists a crushing weight of 93,000 lbs. on the square inch, and an effort of torsion of 15,300 lbs. on the square inch. It expands  $\frac{1}{1250}$  of its length on exposure to the sun's rays in this climate; and shrinks in cooling from the molten to the solid state  $\frac{1}{80}$  to  $\frac{1}{65}$  of its length. HODKINSON states the specific gravity of cast iron to be 7.207, and that the weight of the cubic foot is equal to 470 lbs. WROUGHT IRON. G. R. B.

CASTLE. This word, derived from CASTELLUM, the diminutive of CASTRUM, soldiers' quarters, properly signifies a piece of permanently inhabited ground surrounded by a ditch or a fence as a fortification. The earliest of such constructions remaining in this island are perhaps the groups of British excavations, in the form of pits or dry wells surrounded by one or more enclosures of loose stones, generally found in almost inaccessible situations. Improvements upon these are the structures called burghs or DUNS in the north of Scotland, which must have been occupied to some extent by buildings for the shelter of the defenders and their dependent animals. The necessity of occupying exposed situations at a later period explains the occurrence of the class consisting of an outwork, constructed of stone cemented with mortar, and enclosing an artificial mound as a citadel; the allusions of the Welsh chronicles to the repeated destruction of such castles shows that the mound could only have been surmounted by timber buildings. One of the Welsh conical mounds called 'tomens' occurs in the midst of a Roman camp at Castell-tomen-y-mûr, near Festiniog in North Wales. Arundel, as constructed in the time of Edward the Confessor, is the only castle attributed to the conquered race among the forty-nine enumerated in the Domesday Book; and there are scarcely any means of discovering the character of the fortification of the residences of our Saxon ancestors. VIOLET LE DUC, *Dict.*, s.v. Château, has treated at some length on the rise of the French castles: presuming that the Germano-Frankish chieftains occupied the Roman *villæ*, or country seats corresponding to the old English manor houses with their farm buildings, and added to them the enclosing fortification, he explains the foundation of the feudal or manorial system by comparing such a residence with the Frankish border-fort and the Norman strong-



hold of the time; which he describes as entrenched camps rather than country seats suited to the continuous habitation, and enclosing within their precincts everything necessary to the life of a warrior and his followers. The same author considers that it was the Norman chieftains who, after the middle of the tenth century, set the example of erecting dwellings carefully constructed of stone upon sites well chosen for defensive as well as for offensive purposes; and discriminates at some length between the Norman and French castles of a later period, adding an explanation of the manner in which the château, altering its character in the fourteenth century, became in the sixteenth merely a mansion.

With regard to the general character of the early Norman castles in France as well as in England, it would seem that those which were of small size consisted of a ditch and a bank, surmounted by a palisade or a wall, enclosing a space of from one to two acres in extent, in which the necessary outbuilding surrounded the high mound (Fr. *motte*) upon which stood the donjon or keep, either of timber or of stone. The suggestion might be hazarded that the *castrum*, *pilum*, et *fortalitium* of mediæval documents referred to the ground with its enclosing wall, the mound or *peel*, and the dominating keep. In some cases the earthworks only remain, as at Builth in South Wales, where the two moats and the *motte* or keep-mound are in their original state, but with no remains of masonry; also at Longtown, at the foot of the Black Mountains in Herefordshire, where the *motte* and circular keep remain, and again at Kilpeck in the same county, are extensive earthworks with the masonry destroyed: a fourth, perhaps earlier, exists at Laughton-en-le-Morthen, near Doncaster in East Yorkshire, consisting of an outer ballium and a lofty *motte*, but without any traces of masonry. When the defences disappeared, the keep rarely retained its proper name, but took that of the precinct; and a single tower might thus be called a 'castle': while if this tower, from alterations and additions during the lapse of time, has become a mansion, it still retains the title of 'castle'. In France the word *château* no longer means a castle, and it has been found necessary to coin the term *château-fort*: notice should be taken of the loose application of the term *burg*, a fortified house or tower (*Scottie peel*), to a castle; and of the term *schloss*, a castle, to the palaces and princely residences which were erected from the sixteenth to the nineteenth centuries in Austria, such as that of Lachsenberg, 1600, now an imperial villa and a model of a mediæval castle, and Lichtenstein, 1821, and to some episcopal residences, as at Moldaustein; even an abbey, when granted to a courtier, has become a *schloss*, as at Glocknitz, Kladrau, and Ossiach: in Italy, Spain, and Portugal, however, the appearance of fortification is still generally observed in any building called a castle.

Besides the thirty castles built in the reign of William I, described in *Reports from the Commissioners respecting the Public Records*, fol., London, 1819, p. 439, his sons built still more, and in the time of Stephen (1135-54) eleven hundred and fifteen castles were erected from the foundations, according to RALPH DE DICETO. It will be found that the word castle then began to mean merely a place of residence fortified in pursuance of a licence "batellare et kinnellare"; and charters of the last named monarch mention the *castrum* de Wallingford, *castellum* de Bel Encombe, *turris Londini*, *mota* de Oxenford, *firmitas* Lincoln, and *munitio* Hamptonie, to which synonyms the *dominium* de Man, named by RYMER, *Fœdera*, viii, 95, may probably be added: yet these castles, in the fullest mediæval acceptance of the term, had the ditch, dyke, fosse, graff, or moat, over which was a bridge; the barbican, an advanced work; the outer wall or curtain, from 20 to 25 ft. high, having towers or bastions, and a terraced walk with a parapet, or even a parapet on both sides; the gate-house, flanked with towers; the base court of the Norman period, containing the lodgings, offices, and storehouses of the garrison; as well as the mound with the donjon, if there was no other keep; the inner wall, if

there was more than one line of defence; and finally the keep: the base court became divided into an outer bailey containing all the domestic accommodations, while the inner bailey contained the chapel, the hall, etc. Under the Plantagenets there was even a double or triple line of walls; the outer bailey contained the stables, and sometimes a small mound or cavalier; the middle bailey held the servants' offices; and the inner one comprised the hall, the chapel, and the best apartments: under this system the inner bailey becomes the keep, or rather a quadrangle defended by the gate-houses and towers at the sides and angles, with the hall and other apartments ranged along one or more sides: and around it are the two or three concentric lines of defence. A few fine works of this class were constructed during the Lancastrian and Yorkist periods; but during the Tudor period Nettle hall and Tichfield house show by their titles the change from the castle to the hall. Longford castle, in 1591, seems to have been the last edifice erected in England with any show of being a stronghold until the beginning of the present century, and then the imitation was confined to the keep.

CLARK, in the *Archæological Journal*, 8vo., London, 1844, i, p. 93, has noted the principal features to be found in some of the five hundred castles of England, the same number being supposed to exist equally divided in Scotland, Ireland, and Wales. MILWARD, in the same work, v, p. 42; also HARTSHORN, describing Castleton castle, v, 208; WAKEMAN, *Archæologia Hibernica*, etc., 12mo., Dublin, 1848; BILLINGS, *Baronial, etc., Antiquities of Scotland*, 4to., Lond., 1852; GROSE, *Antiquities*, fol., London, 1773, etc.; KING, *Monimenta Antiqua*, fol., London, 1799; and the various county *Histories*, illustrate the British castles: SHIRLEY, *Some Account of Farney*, 4to., London, 1846, mentions the *crannoges* or abodes of the petty chieftains, and upwards of two hundred *lios* or earthen camps in that district of Ulster. DROUYN, in the *Artes de l'Académie Impériale de Bordeaux*, 8vo., Bordeaux, 1854; DU CERCEAU, *Les plus excellents Bastimens*, fol., Paris, 1576; CHASTILLON, *Topographie Française*, fol., Paris, 1641; with LENOIR and MERIMEE, in the *Instructions du Comité des Arts*, 4to., Paris, 1843, pp. 4-20, 58-62; HUGO, *France*, fol., Paris, 1836, p. 445; RICHARD, in the papers of the *Société des Antiquaires*, x; CAUMONT, *Atlas to the Cours*, v, 63-77; and *Abécédaire*, ii, 293-488; BATISSIER, *Elements*, 12mo., Paris, 1843, p. 530; and OUDIN, *Manuel*, 90-122, and the *Voyages Pittoresques* (especially for Avignon, Coucy, Gaillard, Gisors, S. Marcellin, and S. Michel), give the French castles: while those of the rest of Europe are chiefly to be sought in the various *Delicæ*, and in such topographies as those of ZEILLER: some of the Spanish buildings of this class are described by WELLS, *Pictoresque Antiquities*, 8vo., London, 1846, p. 214.

CASTLE. A term given by workmen to a tall moveable scaffold.

CASTRACANE MARBLE. A rare lumacelle marble, dark brown and rose coloured, with small bright yellow shells.

CASTRES. A city in the department of Tarn in France. It consists of two parts, Castres on the north, and Villegoudon on the south side, of the river Agout, which is crossed by two stone bridges. The cathedral, dedicated to SS. Benoit and Vincent, was almost destroyed by the Huguenots in 1567 (the see was suppressed in 1801); three other churches; an episcopal palace, said to have been designed by Mansard, now the hôtel-de-ville; two hospitals; a theatre; and cavalry barracks, are the chief public buildings. 14. 50. 96.

CASTRO. A seaport city in the province of Terra di Otranto in the kingdom of Naples, is only remarkable for an old castle, and for a large well built cathedral dedicated to the Assumption. The see was removed to Acquapendente in 1647. 50. 96.

CASTROHUOIN or CALMAT. The name given to the site of the ruins of some magnificent structures, situated about fifty miles from the river Euphrates, and forty miles from Palmyra in Syria. One, as seen in 1782 by Sir William Donkin, is de-

CATACOMB

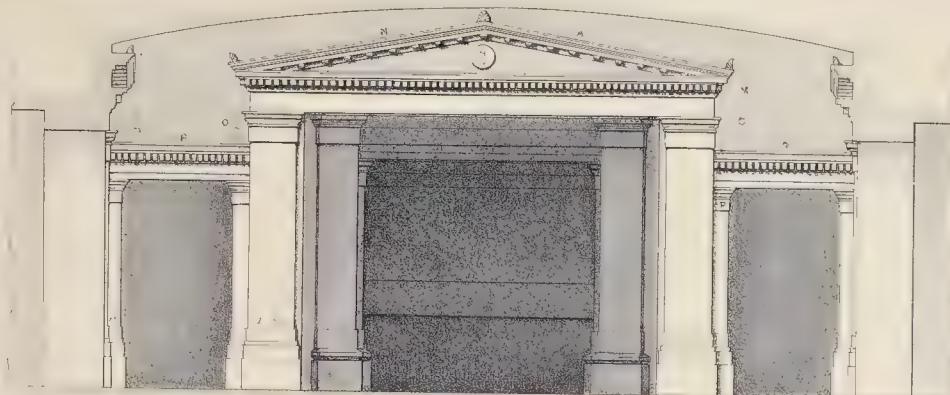


Fig. 3 SECTION on line C.D.

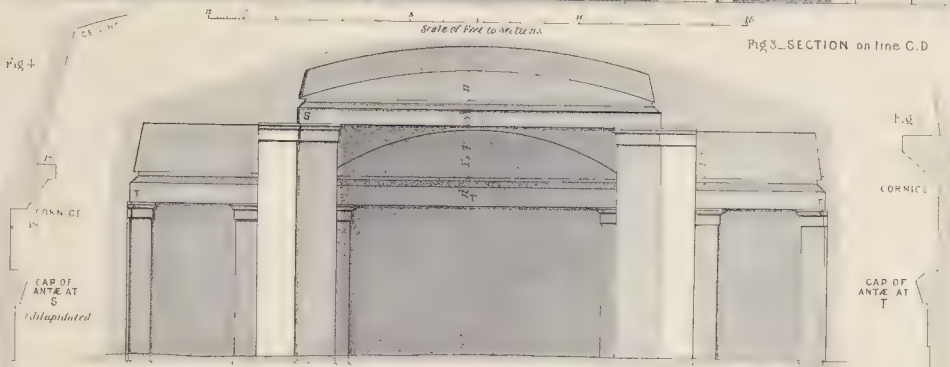


Fig. 2 SECTION on line I.K.

The stonework was perished  
under the bed



PLAN. Fig. 1

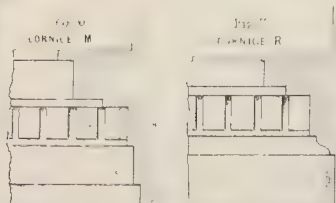


Fig. 4  
CAP OF  
ANTA O

Fig. 5  
CAP OF  
ANTA P

CORNICE TO  
PEDIMENT N

The section, detail and the sketch portion of  
the plan are from the original  
The lighter portion of the Plan is taken from  
the original sketch work. Description of the original

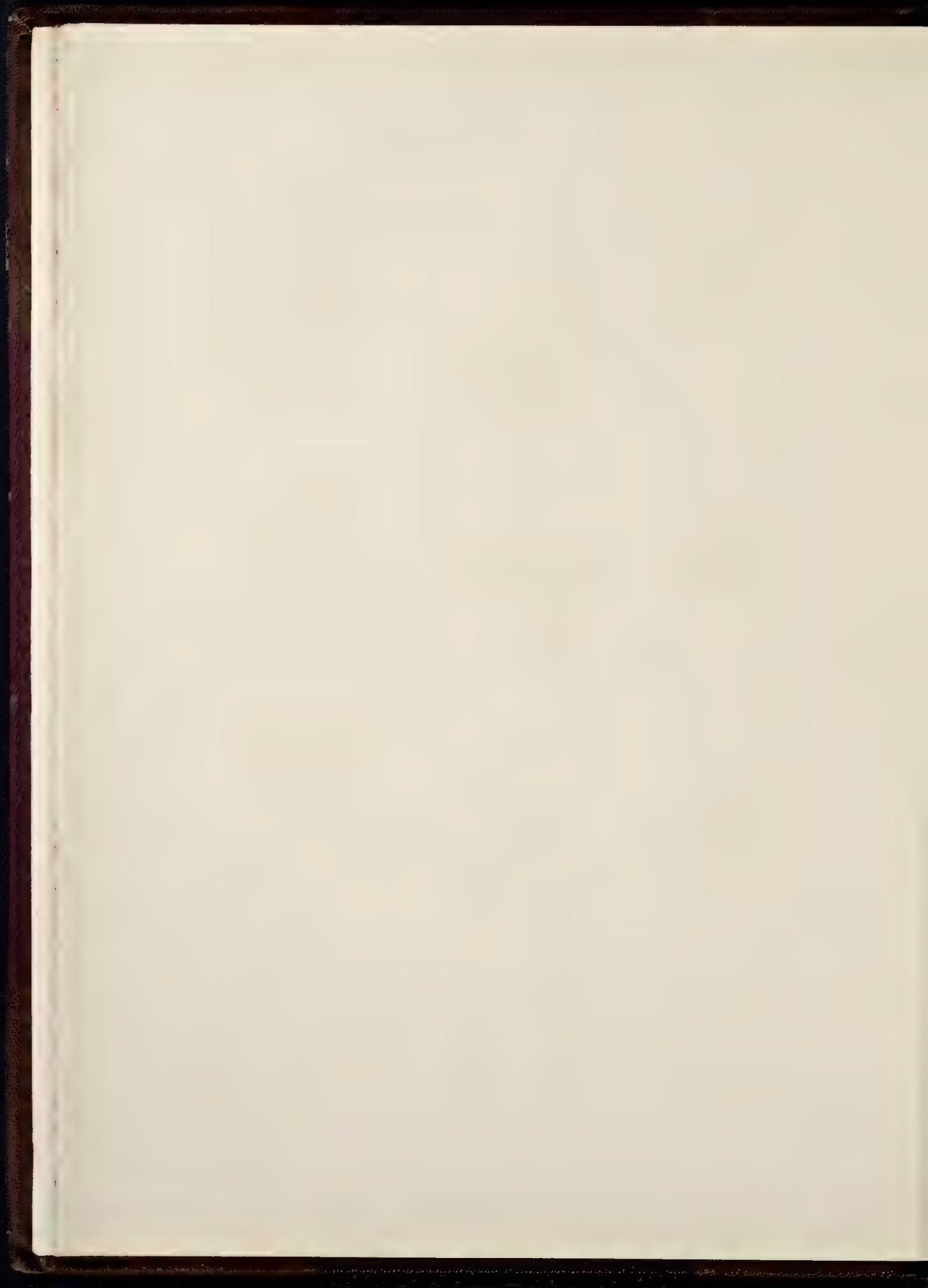
ROCK EXCAVATIONS  
AT  
ALEXANDRIA.

Scale of each Plan

J.J. Scoles M.I.B.A.

Drawn and engraved by J.J. Scoles on Jan. 28th 1894





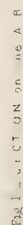


FIGURE 1. The CTUN gene in A. B.

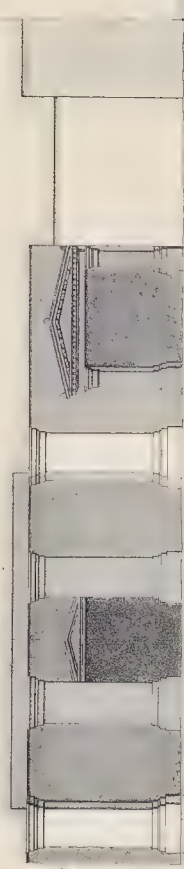
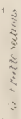
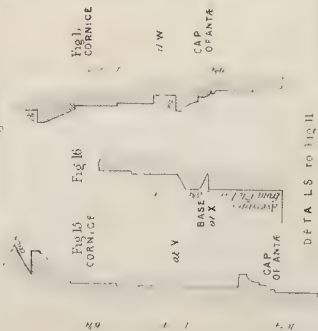


FIG. 13. SECTION on line G-H.



DATA LS TO FIG 11



1. ... CONTINUATION OF FIG. II

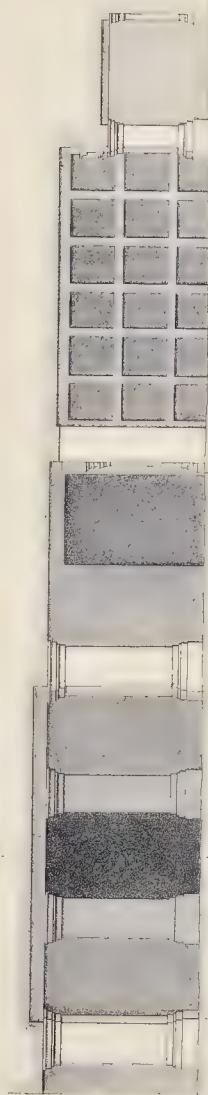


FIG. 14 - SECTION ON REF

Fig. 1. Dependence of  $\Gamma_{\text{core}}$





scribed as 1200 ft. square, with windowless walls, in many places entire and 40 ft. high, composed of very large blocks of cut stone, having a circular tower at each angle, and two others on each side rising above the walls; a cloister of semi-circular stone arches in the interior had been supported upon monolithic shafts of white stone, standing about 20 ft. from the wall; the centre was filled with ruins. At the distance of a quarter of a mile was another square building, similar, but about a quarter less in size, having a very large archway with a sculptured soffit above niches in the wall about 7 ft. 6 ins. thick, and an earthen terrace on brick arches 20 ft. high, supported upon shafts standing about 30 ft. from the wall: the towers were more ornamented; the centre was almost free. Between these edifices was a tower 15 ft. square, much higher than the other remains, with stairs still remaining perfect from 12 ft. above the ground. The execution of the arches, columns, and other marble work, is highly praised. ASIATIC RESEARCHES, 4to., Calcutta, 1795, iv, 401.

**CASTRUM.** This Latin word, in conformity with its use by NEPOS, *Alcib.*, 9, and by VIRGIL, *Æneid*, vi, 776, has been considered as an augmentative of *casa*, and as meaning in its primary sense a large or strongly built cabin, and thence the quarters, fortified sometimes with a wall and sometimes with a ditch, of a considerable military force; this frequently became the nucleus of a village, and even of a large town, to which it might serve as an acropolis, a capitol, a citadel, or a fortress. The Gallo-Roman castrum at Jublains is described by CAUMONT, *Abécédair*e, 8vo., Paris, 1850, ii, 271-6. *Castra*, the plural of this word, always means an entrenched camp, the formation of which is described by POLYBIUS, by HYGINUS, and by VEGETIUS, and explained by KING, *Munimenta*, fol., London, 1799, ii, 80 and 97. **CASTELLUM**; **CENTO-CAMERELLE**. 25.

**CASUARINA** (Malay, *filao*; South Sea Islands, *clubwood*). A genus of trees growing in New South Wales. Several species are known, collectively called Botany Bay oak, and sometimes beefwood. They all yield wood of a similar character, and receive the following names indiscriminately:—

*C. equisetifolia*, He oak, a low tree of no great beauty or value, growing on open grounds; *C. torulosa*, forest oak; *C. paludosa*, swamp oak; *C. quadrivalvis* or *stricta*, She oak, also beefwood. The wood is hard, and of an excellent quality; whilst, being ornamental, it is well adapted for inlaying and for marqueterie; the colour is a light yellowish brown (but sometimes resembles a full red mahogany), often marked with short veins of a redder colour; these are small, slightly curled, and closely distributed. The wood, which takes a high polish, is shipped in logs from 9 to 14 ins. in diameter.

One of the coral isles of Angosta or Angozha in the Mozambique channel, called Mafamele, is covered with a grove of these trees, some of which measure about 10 ft. in circumference, and most of them are perfectly straight, without a branch for 30 or 40 ft. above the ground, and many are 150 ft. high.

**CATACOMB.** Two derivations are offered for this word; in both the Greek *κατά* is acknowledged; but the remaining half is found about A.D. 600 written *tumbæ* and *cumbæ*, the one meaning a tomb, the other a hollow, and the synonyms occur of *arenæ*, *arenarium*, *crypta arenaria*; all employed as general names for one or more excavated passages with graves made in the walls, or floor, or with cells used as bone-houses. Such are found in many countries that contain quarries of stone easily cut, and so adhesive as not to fall. Milo, Syracuse, Naples, Rome, and Paris, have the largest; those at Citta Vecchia in the island of Malta (SAINT NON, v, 259), Palermo, Aquila, Brescia, Chiuse, Florence, Lucca, Milan, Nola, Padua, Palestrina, Pozzuoli, Terni, and Spoleto, are of somewhat less extent; a catacomb, if it may be so called, at Alexandria, interesting for architectural character, is given in *Illustrations*, pl. 28, 29; and in the *Description de l'Égypte*, planches v, 42, texte v, 519; and see iv, 366.

Although the practice of interment never ceased at Rome, antiquaries have ignored the pagan occupation of the catacombs

ARCH. PUB. SOC.

at that city, and have not sought for them of a date much earlier than A.D. 100: those at Milo (illustrated by FORBIN, *Voyage dans le Levant*, fol., Paris, 1810) and at Syracuse claim a much more remote period: a plan of part of the latter, copied from MIRABELLA, showing long galleries nearly straight, with alleys running out of them at right angles, and circular chambers at the chief points, is given by WILKINS, *Magna Græcia*, fol., Cambridge, 1807, p. 50; and another by Renard is given in SAINT NON, *Voyage Pitt. de Naples*, fol., Paris, 1781, iv, 298, which is only a portion of, and very different from, that already named: these catacombs, described by LUPI, *Dissertationi*, ii, *Lettere Erudite*, ii, 9, considered to be the finest and largest that are now known, and to have been specially excavated for the purpose, were apparently also used as prisons. The next in importance are those at Naples, described by PELLICCIA, *Dissertatio de Cameterio sive Catacumba Neapolitana*; by SAINT NON, i, 80; and by CELANO, *Descr. di Napoli*: these have five or six tiers of graves in height, but each received only the one body for which it was specially prepared. The main passage is 18 ft. wide and 14 ft. high. At Rome the passages, which wind very much, are generally about 8 or 10 ft. high and 4 or 5 ft. wide, the walls being hollowed out into a *loculus* if only one coffin was inserted, but into a *bisomum*, *trisomum*, or *quadrisomum*, according as there was room for two, three, or four bodies: in some cases there are two or three of these galleries in height. At intervals these passages converge and expand into large vaulted chambers. *Roma Sagra*. ZORN, *De Catacumbis*, fol., Leipsic, 1703; FEMELIUS, *Dissertationes suas de Catacumbis Romanis*, fol., Leipsic, 1710; ERITHRACUS, *De Roma Subt.*, fol., London, 1650; BOSIO and SEVERANI, *Roma Sotterranea*, 4to., Rome, 1710; ARINGHI, *Roma Subterranea*, fol., Rome, 1650; ARTAUD, *Voyage dans les Catacombes de Rome*, fol., Paris, 1810; MACFARLANE, *Catacombs of Rome*, 8vo., London, 1852; PERROT, *Catacombes de Rome*, fol., Paris, 1852; and RAOUL ROCHETTE'S works. The catacombs at Paris were not used until 1780, when the churchyards of that city were emptied of their contents, and then deposited in the quarries. THURY, *Descr. de Catacombes*, 8vo., Paris, 1815. It appears that the extensive excavations near Maestricht may have been similarly occupied.

HARTMANN, *De Origine Cryptarum*, Marburg, 1733; COCHET, *Normandie Souterraine*, 1854; SANCHEZ, *La Campania Sotterranea*, 8vo., Naples, 1833; FOREIGN QUARTERLY REVIEW, xv; BURNET, *Some Letters*, 8vo., Amst., 1686, p. 202.

**CATACUMBA** is also applied to the atrium or courtyard of a basilican church, according to the *Annales de Philosophie Chrétienne*, xvii, 422.

**CATAFALQUE** (It. *catafalco*). A term adopted from the French language for the decorated framework which was formerly called a hearse or HERSE.

**CATALPA**, a timber tree of America, see BIGNONIA.

**CATANIA** (the Greek CATANA, and the Roman CATINA). A seaport city in Sicily. The ruins of the ancient edifices have been described by BISCARI, *Viaggio*, 4to., Naples, 1781, pp. 27-45. The dilapidation of the amphitheatre was commenced in 498, when Theodoric allowed the use of the materials for the repairs of the town walls and public buildings (CASSIODORUS, *Var.*, iii, 49); the arena was 242 ft. 6 ins. long and 177 ft. wide. The theatre has served as a quarry to the cathedral; GOLDICUTT, *Antiquities*, fol., London, 1819, pl. 59, gives a plan showing that the orchestra was about 80 ft. in diameter. An adjoining structure is also illustrated, and described as an odeon having an orchestra of about 47 ft. in diameter: there is a difference of about 40 ft. between the levels of the arenas of these two edifices. Only a few fragments of the aqueduct, thermæ, and Roman sepulchral monuments, have been visible since the irruption of lava from Mount Etna in 1669: all these are illustrated by FASO PIETRASANTA (the duke of Serradifalco), *Antichità*, fol., Palermo, 1834, v, 3-30, pl. 1-18. In consequence of the damage caused by an earthquake 22 January 1693, the



city has been rebuilt; each of the principal streets is about a mile in length, and imposing from its width, which is too great for the climate. The longest is terminated at one end by the cathedral, while the view at the other is closed by Mount Etna. The buildings are of lava, chiefly faced with magnesian limestone from Malta or Syracuse, and many of the palazzi (which generally have the front on the street with an open court [L]) have been commenced on a scale too large for completion, which has also been retarded by the earthquakes of 1783 and 1818. SAINT NON, *Voyage Pitt.*, fol., Paris, 1781, iv, has given, pl. 25-30, views of the great quay, with a large monastery, the palazzo Biscari, and some fine houses; of the piazzas del Mercato and del Duomo or dell' Obelisco, with an elephant (of the Lower Empire) carrying an obelisk (covered with hieroglyphics), which were erected in 1736; of the cathedral; and of the amphitheatre. The general details of the domestic architecture may be learnt from plate 83 of the *Illustrations*, indicating the style prevalent about the year 1700 in the south of Italy. The cathedral, dedicated to Sta. Agata, has granite columns and marble and stonework taken from the theatre by count Roger in 1094, and was nearly rebuilt with materials from the same quarry soon after 1693. HITTOREFF and ZANTH, *Arch. Moderne*, fol., Paris, 1831, pl. 34, 35, 41, give two doorways, and a view of the piazza del Duomo, with the front of the *palazzo pubblico*, and of Sta. Agata. GALLY KNIGHT, *Normans in Sicily*, 12mo., London, 1838, p. 156, and *Saracenic, etc., Remains*, pl. 10, gives the Romanesque portal, which was removed from the cathedral when the western front of it was modernized by Vaccarini in 1734, to the *palazzo pubblico*, and from that building when it was altered in 1750 to the church of S. Carcere: he observes that the drill has been much employed in the execution of the ornament, and thence presumes that it was the work of Greek artists. Among the great number of public buildings the eight churches, the fourteen monasteries, the five convents, the *palazzo del senato* or *magistratura principale*, the theatre, the university and *seminario*, with several schools, public libraries, and two hospitals, are the principal objects of interest. HOUËL, *Voy. Pitt.*, fol., Paris, 1784, ii, 116, gives a plan of the city, and several plates of antiquities and views.

The Benedictine monastery of S. Niccola surpasses in magnificence every other religious group in Sicily, and is next only perhaps in Europe to that of the Escorial in Spain. It is seated on the rocky bed of lava, which in parts has been cut away, excavated, or levelled, to receive the foundations, the courts, the terraces, and the gardens. It is supposed to occupy part of the site of ancient *thermæ*, fragments of the walls and mosaics still existing *in situ*. The central feature, which advances to the front, is the church, above 350 ft. long, and 210 ft. wide at the transepts. It is flanked on the north side by two cloistered courts, each surrounded on two stories by an arcade, and an inner corridor also, to exclude the heat of the Sicilian sun, and the entrance to the western one is formed by a superb vestibule, having staircases to the right and left, enriched with columns and marbled walls. Behind the church is another court. The original plan doubtless contemplated the like disposition on the southern side of the church, as shewn in HITTOREFF and ZANTH, pl. 36-40, who give a list of the architects employed. But here an irregular suite of buildings has been erected, containing a refectory, 117 ft. long by 42 ft. wide; a kitchen, like that at Glastonbury, 42 ft. wide within the walls; the library, 72 ft. long; and the museum of natural history, above 200 ft. long by 35 ft. wide. The gardens at the rear are laid out in a grand style, and contain a flora, hortus botanicus, and a columned belvedere, jutting out on the lava, and embracing one of the finest views in the world, viz. of the Mediterranean, Etna, and the island. Altogether this convent well repays a careful study of its grandeur, and is a proud monument of the learned and wealthy brothers, thirty of whom are noble, and devote their fortunes to their sumptuous reli-

gious retreat, the fixed yearly revenues of which amount to £50,000.

T. L. D.

CATANZARO (the Latin CATACIUM or CATANZIUM). A city in the province of Calabria Ultra Secunda in the kingdom of Naples. It contains a citadel; a cathedral under the invocation of the Assumption, the chapter sitting in S. Francesco, one of the ten churches; three monasteries and two convents; two hospitals; and a *seminario*. The city has been for the most part rebuilt since an earthquake in 1783. 50. 96.

CATBAND. The name given in the north of Great Britain to a chain to be drawn across a street, and to a bar of iron for securing the outside of a door. 109.

CATBAR. An iron bar, three-quarters of an inch square, for keeping a folding door fast when shut; it has a ring at one end for fastening to the wall with a staple, and is bent at the other to hook into the door by another staple on the inside.

CATECHUMENON (Gr. *κατηχουμενον*). A term used by the emperor LEO, *Novel.*, lxxiii, and by several writers, for the upper room or GALLERY, appropriated to the use of females in the Eastern churches: the word has also been applied to a school attached to a church. BINGHAM, *Origines*, iii, 10, iv.

CATENA. A Latin word, generally meaning a chain, but used by VITRUVIUS, vii, 3, to express a bracket to carry a plastered ceiling.

CATENARIAN CURVE. The line marked against a wall by a chain, suspended freely by pins at its two ends, has been considered to be the precise curve for an arch, the materials of which are infinitely small and of equal weight, in order that all the parts may be in equilibrium. This principle, applied in the stone bridges of Neuilly, Limerick, and Gloucester, has been proposed in a design by R. Stevenson for a chain bridge of 150 ft. span, given in HANN and HOSKING, *Bridges*, 8vo., London, 1843, clxxiv, pl. 104-7. "In respect to arches, their strength doth not so much depend on their shape as the weight they bear being well adapted to them; for although it must be granted that catenarian arches, if considered independent of any weight but their own, are the strongest of all others, yet if the weight on their crowns is not proportionate to the height they rise, they may be said to be weaker than a semicircle, or arches of any other form, when their weight and abutments are well proportioned." CRESY, *Encyc.*, 417-22. When two of five quantities are known, viz. the angle, the abscissa, the length of the chain between the vertex and the point of suspension, the tension at the vertex, or the tension at the points of suspension, the other three may be obtained geometrically, or from a table of tangents and secants. Cases where the density or thickness of the chain is variable have been investigated in CRESSWELL's translation of VENTUROLI, *Elements*, 8vo., Cambridge, 1822, and in WHEWELL, *Analytical Statics*, 8vo., Cambridge, 1833. A geometrical account of this curve, with tables, is given in WARE, *Tracts*, 8vo., London, 1822.

CATER or KATUR. The old term for a QUATREFOIL.

CATHAIR (pronounced CAHIR). An Irish term applied to circular entrenchments with walls of circumvallation, built of uncemented blocks, of stone rude from the quarry, except that some of the jambs have been hammer dressed. They are from 40 to 250 ft. in diameter, and are of two classes. The first and most numerous are akin to the fort or rath, the walls being from 5 to 15 ft. thick and from 5 to 10 ft. in height, with one or more entrances, sometimes surrounded by a ditch and an earthen agger. Within the interior are generally artificial chambers connected by long galleries, and sometimes curious bee-hive shaped structures of uncemented stone called cloc-hans, either singly or in groups. The second class are from 40 to 90 ft. in interior diameter, the walls being from 10 to 16 ft. in thickness and from 10 to 20 ft. in height; the masonry is of a better description than in the former class, the hammer having been used in some instances on the joints, but not on the face; the exterior face of the wall has usually a curved batter; and on the interior face are two or more offsets

from 2 to 3 ft. in width, the ascent to these offsets or terraces being by flights of rude steps taken off the thickness of the wall: chambers and narrow galleries are usually found in the wall, the chambers being covered by overlaying courses of stone; the galleries are linteled with stone flagging: the one entrance, less in width at top than at bottom, is usually from 4 to 5 ft. in width and from 5 to 6 ft. in height, the jambs are built of large blocks; the head is square, linteled with massive blocks. Examples of this last class are found at Staigue-fort and Cathairdarniel, near Kenmare, county of Kerry, and at Ailech, county of Londonderry. ROYAL IRISH ACADEMY, *Transactions*, xiv; ORDNANCE SURVEY OF LONDONDERRY, Dublin, 1837.

R. R. B.

CATHEDRA (Gr. καθέδρα). The old term for an episcopal chair or FERONE.

CATHEDRAL, or more properly CATHEDRAL CHURCH (It. *duomo*, *cattedrale*; Sp. *catedral*; Fr. *cathédrale*; Ger. *dom*). The head or principal church of a district, whether the see be independent or united with another, in which the *cathedral* of an archbishop or a bishop is permanently fixed, and in which he is installed upon being canonically established in his see. In general the town which contains a cathedral of the dominant form of religion is called a city; but when the place ceases to be the seat of a bishopric, the city often retains the rank it has obtained: when the episcopal throne was removed, the edifice was frequently left, and styled a COLLEGIATE CHURCH: when the form of religion professed by the bishop and his clergy is no longer that professed by the State, the church equally often retains the title of cathedral. Some cities, as Belley, Brescia, Carcassonne, Coimbra, Dublin, Lisbon, Piacenza, Przemysl, and Saragossa, have or had at one time two cathedrals. In Italy a large church is sometimes called a *duomo* on account of its size, as at Pietrasanta, near Massa Ducale; and this is the case with the *duomo Vecchio* at Pisa, unless the present *duomo* be a copy of that church of S. Paolo. Sufficient attention has hardly been paid to the peculiarities of plan which some cathedrals exhibit, and to the secular purposes for which parts of some cathedrals have been employed. An intimation of them is given by EADMER, *Vita Gregorini*, stating that Cuthbert, archbishop of Canterbury 742-759, built an *ecclesia* almost touching the east end of the greater *ecclesia*, and dedicated it to S. John the Baptist, intending it for the archiepiscopal tomb-house, the baptistery, and court-house, in which provision was made for the "examinationes judiciorum pro diversis causis constitutorum, quae ad correctionem sceleratorum in ecclesia Dei fieri solent"; as given in the *ANGLIA SACRA*, fol., London, 1691, ii, 186: the Saxon cathedral is described by WILLIS, *Arch. Hist.*, p. 20-29. FERGUSSON, *Illustrated Handbook*, 8vo., London, 1856, 482, 484, 498, 580, 619, 844, has alluded to this, and to the secular character of the *ecclesia* in early times; to the general propinquity of a baptistery or a tomb-house to the basilican church, as at Parenzo; to the obliteration of the atrium by which, as at Torcello, the circular or octagonal building nearly touched the entrance end of the basilica; to the illustration at Laach of the use as a tomb-house of the western apse in the German cathedrals; and to the manner in which, as at Dijon, the French architects used the circular or octagonal buildings as the sanctuary, adding a square nave to it: this author also notes the contrary English and German custom of adding a square sanctuary to the round or polygonal edifice. VIOLLET LE DUC, *Dict. s. v.*, p. 280, also notices that until the fourteenth century cathedrals were civil as well as religious edifices. Such structures may be expected to exhibit the finest examples of ecclesiastical architecture; but some, like Beziers in Languedoc, near the Gulf of Lyons, are castellated in appearance, and others, like Almeria on the coast of Granada, were fortified to resist a *coup de main* from corsairs.

There are few collections of cathedrals; among the best are SIMONAU, *Principaux Monuments Gothiques de l'Europe*, fol., Bruxelles, 1843; ROBB, *Chiese Principali*, fol., Milan, 1824;

ARCH. PUB. SOC.

and CONEY, *Ancient Cathedrals*, etc., fol., 1832, and *Beauties of Continental Arch.*, 4to., London, 1833; the plans given in FERGUSSON, *Handbook*, are mostly drawn to an uniform scale. Reference should be made to BOURASSÉ, *Cathédrales de la France*, 8vo., Tours, 1843; CHAPUY, *Cathédrales de la France*, 4to., Paris, 1826-31; VIOLLET LE DUC, *Dict.*, s. v. *Architecture Religieuse*, and *Cathédrales*; WINKLES, *French Cathedrals*, 4to., London, 1837, for some in France; MÖLLER, *Denkmäler*, fol., Darmstadt, 1840, for some in Germany; GALLY KNIGHT, *Ecclesiastical Architecture of Italy*, fol., London, 1842-44, and *Normans in Sicily*, fol., London, 1840; D'AGINCOURT, *History*, fol., London, 1847, for several in Italy; BROWNE WILLIS, *Survey*, 4to., London, 1727-30; STORER, *Hist.*, etc., of *Cathedrals*, etc., 8vo., London, 1814-9; BUCKLER, *Views of Cathedrals*, 4to., London, 1822; MOULE and WINKLES, *Cathedrals of England*, 4to., London, 1842; the series by BRITTON, WILD, and others; with the tables of dates, etc., in DALLAWAY, *Discourses*, 8vo., Lond., 1833, for those in England and Wales; BILLINGS, *Baronial*, etc., *Antiquities*, 4to., London, 1845-52, for Scotland; and PETRIE, *Ecclesiastical Arch.*, 8vo., Dublin, 1845, 2nd edit., for Ireland. Works detailing a single cathedral will be found mentioned herein under the name of its city. A long description of the arrangements of a cathedral of the Greek Catholic Church is given in the *ECCLESIOLOGIST Journal*, iv, 105. BASILICA.

CATHERINE WHEEL WINDOW, see WHEEL WINDOW.

CATHERWOOD (FREDERICK), born in London 27 Feb. 1799, was a pupil from 1815 to 1820 of Michael Meredith; during 1821-25 made an extensive tour in Great Britain, on the continent, and in Egypt; designed a large glass house building near Westminster bridge, and some houses at Pentonville; left England again in 1831, travelling through Germany, Malta, and Northern Africa, to Thebes, of which place he made the sketches for a panorama subsequently exhibited in London; several drawings of Karnak, etc., for Robert Hay, as well as one to scale of the great statues of Amonoph at Gorneh, also discovering by excavations that they reposed on a stratum of sand; and is said to have been employed by Mahommed Ali in the repairs of various public buildings. In August 1833 he managed to measure and delineate the mosque of Omar at Jerusalem, made sketches for a panorama exhibited in 1835, and collected materials for the subsequently published plan of Jerusalem. In 1834 he went to New York, where he erected a panorama, which with the view of Jerusalem were destroyed by fire. Panoramas of Baalbec and of Damascus are also said to have been furnished by him. In the United States he practised until 1839, when with J. L. Stephens he made the tour described in *Incidents of Travel in Central America, Chiapas, and Yucatan*, 8vo., New York, 1841: the journey was repeated in that year, and its results published in *Incidents of Travel in Yucatan*, etc., 8vo., New York, 1843, with a volume of *Views of Ancient Monuments of Central America*, etc., fol., London, 1844. In 1845 he left England for Demerara, where as civil engineer he formed the railway from Georgetown to Mahaica, and superintended a line of railway from Chagre across the isthmus of Panama. In 1851 he went for the sake of his health to California, reported to the United States' government relative to the practicability of forming settlements on the Columbia river, Vancouvers island, etc., and erected wharfs, warehouses, etc., at S. Francisco. In 1851 he was in England, but in the same year returned to survey for a line of railway from Marysville in California; and proceeded through Mexico to England in 1853, where he revised the London edition of the *Incidents*. In September 1854 he left Liverpool to return to his property in California, but was involved in the loss of the steamer 'Arctic'.

J. J. S.

CATHOLE. The name given in the northern portion of Great Britain to the loopholes or narrow openings in the walls of a barn; and also to niches made in such walls for the reception of small articles.

109.



**CATHUD.** The Scottish name for a large upright whinstone serving as the back of a fireplace, and placed so much in front of the wall of a cottage as to leave room for a large seat between it and the wall.

**CAT'S HEAD ORNAMENT,** see **BIRD'S HEAD ORNAMENT.**  
**CAT-STEPS,** see **CORBIE,** or **CROW STEPS.**

**CATSTONE.** A term sometimes applied to a BARSTONE.

**CATTARO.** A seaport city in the district of Albania in the Austrian dominions. The castle, having strong walls, is entered by three gates and defended by towers. The narrow and gloomy streets are formed by houses in the Venetian style. The old stone cathedral dedicated to S. Trifone, a Greek church, a collegiate church, two monasteries, and a hospital, are the chief buildings. 50. 96.

**CATTERTHUN,** see **DUN.**

**CATTLE LAIR** or **LAYER.** A covered shed for the reception of cattle at a market while not being exhibited for sale. The cattle lairs in the Parisian abattoirs are usually about 148 ft. long by 30 ft. wide and 15 ft. high, holding about 50 bullocks and 400 sheep; the former being fastened to rings about 3 ft. 4 ins. apart let into the wall, and the latter enclosed in pens fitted up with racks. *Detached Essay,* ABATTOIR, p. 2.

**CATTLE MARKET.** A place for the sale of cattle. Among the fundamental principles which should guide the selection of a site for a cattle market the most prominent are the vicinity of a large extent of pasturage, which although not indispensable is highly desirable; the level character of the natural ground to be used; the shortness of distance that the animals shall have to walk from the stations of their arrival by land or water; the supply of water; the opportunity of preserving or removing the drainage; the convenience of access from the market to the town; and tendency of the town to increase in any other direction; and the prevalence of winds from the town over the site.

The market at Poissy, seventeen miles from Paris, which occupies about eight acres, will contain 2400 bullocks, 1000 calves, and 14,000 sheep. The market at Sceaux, which occupies about seven acres, will contain 1240 bullocks, 1,000 calves, and 10,000 sheep. The separations for the cattle are made by wrought iron bars let into granite posts, so as to form divisions about 130 ft. long by 13 feet wide; the top rail, 1 ft. 10 ins. from the ground, is  $1\frac{1}{2}$  in. and the bottom rail  $\frac{1}{2}$  in. diameter; the posts, 12 ins. diameter, are 8 ft. apart, except in the middle where a passage is reserved. The calves are exposed for sale upon a raised and covered platform. The asphalted area for the sheep has pens formed by wooden hurdles let into wrought iron posts, as stated in the arrangements and statistics of the French cattle markets given in the *BUILDER Journal*, viii, 1, 28, 38; which also contains, xii, 618, a view and description of the new Metropolitan Cattle Market, commenced by Mr. Bunning 1 August 1853 and opened 13 June, 1855. This is an area, paved with granite pitching, about fifteen acres in extent. A central tower, rising from a dodecagonal group of banking-houses, stands in an avenue separating the market, having 13,232 feet of rail for the tying of 6,616 (or 6,794) bullocks, from the market, having 1,749 pens for 34,980 (or 43,320) sheep (with room for additions); outside this last are the markets, each about an acre in extent and under cover, for 900 pigs and 1425 calves. These buildings have the floors raised to the general level of the carts, which unload under a shelter. North of this nucleus, which is surrounded by a railing, are two taverns and a site for the annual exhibition of prize cattle. The western wing of the market is *lavage* with racks and troughs for 8,160 sheep on an area of six acres, three being occupied by covered buildings. The eastern wing is allotted to a proposed market for hides and skins. South of all the above is the *lavage*, with a rack and trough for each animal, for 3,000 bullocks on an area of eight acres, having four haylofts; these are flanked to the east by private slaughterhouses, and on the west by two

public slaughterhouses for dressing 600 bullocks weekly, placed to the south of a market for meat. Tanks for water and gas (water-posts being fixed at every 80 feet), official residences, four public-houses, etc., are included in an expenditure of £300,000. *Detached Essay,* ABATTOIR and illustrations.

**CATTLE SHED.** (*Fr. étable*.) A building for the protection of cattle at night from the inclemencies of the weather. *GWILT, Encyc.*, recommends that such a place should not be less than 19 feet wide, and notices the necessity for equal temperature, ventilation without draughts, convenience of foddering (from the head is preferred), and means for quick cleansing and drainage. Although it has been long known, as remarked by *DEAN, Essays on Farmbuildings*, 4to., Stratford, 1849, that more loose animals can be fed in a circular shed than in one of any other form (he recommends 30 ft. diameter in the clear), it is more usual abroad than in Great Britain to erect circular sheds even in model farm-buildings; that at Juvisy, given by *NORMAND, Paris Moderne*, 4to., Paris, 1837, iii, 75, is about 40 ft. radius to the inside of the wall, with a raised pathway 6 ft. wide; and about 12 ft. 6 ins. radius to the outside of the nucleus round which the rack is placed. In such cases,

A horse averages 8 ft. 0 in. long, 6 ft. 6 in. high, 2 ft. 0 in. wide.

A bullock do. 7 6 do., 5 0 do., 2 6 do.

the head of a bullock is about 2 ft. 8 ins. across the horns, but this depends upon the breed; 12 ins. are allowed as the width of the head of a horse.

Sheds should not only be open to the roof (at least over the stalls) but should be roomy. Each class of buildings should be distinct and (though the rule is not always observed) also separated: horses require a different temperature from oxen; the latter, while fattening, should not be disturbed by any irregular noises from the stables or piggery, and cows should be quite separated from the calves, which require the greatest attention to keep them clean; the best constructed pens have false bottoms of boards pierced with holes for drainage.

The general system in England when bullocks are set apart to fatten, has been to place them in a yard, with on one side an undivided shed, leaving the manure to accumulate to a height of two or three feet in the yard; but it has become the custom to tie up or at least to separate the bullocks. In the northern counties especially, the stock is confined by pairs in small sheds of 10 or 12 ft. square, called *hammels*, with yards in front, of twice that area, the whole being drained to a sink in the centre of the yard. In Norfolk, bullocks are fastened by the neck with chains, swivels, and rings playing upon posts 7 ft. high, in sheds containing ten animals; one such shed is placed as a lean-to on each side of a central building, 36 ft. long by 19 ft. wide, with a pair of folding gates, say 13 ft. high at each end. This is called the turnip house, but may serve as a temporary barn, the turnips being kept at one end; its sides are only formed by the racks of the cattle, and thus plenty of air is obtained; the sheds, with eaves 6 ft. from the ground, are close-boarded, except where entrances with folding hatch-doors are left at each end of the long side.

In Gloucestershire a different system has been pursued: each shed has solid gables and walls to the north or east from 5 ft. to 7 ft. high, and with posts on stone bases to the south or west: a gangway 3 ft. 6 ins. or 4 ft. wide separates the racks from the wall of the long side of the building, the stalls are about 10 ft. long by 8 ft. wide for bullocks singly, or 14 ft. wide for bullocks in pairs; a smaller width is considered sufficient for a pair of Devonshire bullocks, to these a space of 8 ft. or 9 ft. is allowed. In a model dairy farm 4 ft. in width is allowed to each cow; or not less than 5 ft. for cows of a large breed; and 6 ft. if kept within doors all the year round. The separations are made by swing bars or broad rails passing from headposts standing inside the racks to heelposts, 7 ins. by 4 ins., both posts standing on metal or stone bases and entering chases or slots made in the tie-beams running across the stall; each stall has a gate which closes to an outside wall boundary 4 ft. high, or at

pleasure to the opposite pillar; thus the animal is at liberty to move about in the stall and yard, until the gates are closed to allow the farmer to use the yard as a passage. Hardburnt bricks laid on edge in mortar form the usual pavement, which should be quite level. The cake-house and rick-yard should not be far distant. The manger should not be higher than the knees of the cows, 18 ins. broad, and a foot deep, divided into three parts, for dry food, water, and moist food. *LOUDON, Cottage, etc., Arch., 8vo., London, 1842, 384.*

A double range of stalls is not uncommon in France and England; but there is the inconvenience of the central area for dung to be placed against economy in building. Sufficient attention has not been given to the provision of windows with movable luffer boards in the gables and roofs of such closed buildings.

Figs. 1 and 2, contributed by Mr. James Wyllson, are explained by him to be a half-section and plan of a bire or byre (*Anglicè*, cowhouse; *Fr. vacherie*) as built in Scotland at the present day, shewing a central gangway 4 ft. wide, and a depth of 8 ft. 6 ins. each side of same for the stalls. A, the grupe (*Anglicè*, grip, a gutter), the channel for leading away the muck, about 3 ins. deep at one end with a fall of one inch in eight feet to the other end, where it is continued through the wall of the cowhouse by a small arched or linteol opening of corresponding width. BB, stall-divisions of laminated or paving stone about 4 ins. thick, droved or chisel-dressed on sides and edges. CC, droved stone troughs for containing water and soft food. D, cow-bindings, de-

Open timber roof.

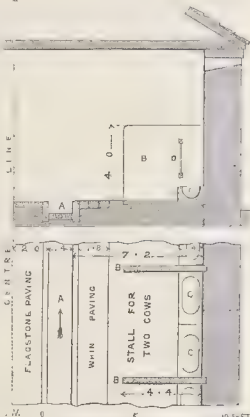
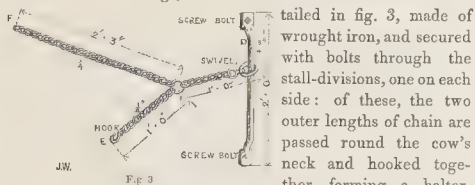


Fig. 1 and 2.



tailed in fig. 3, made of wrought iron, and secured with bolts through the stall-divisions, one on each side: of these, the two outer lengths of chain are passed round the cow's neck and hooked together, forming a halter.

There is usually a door at each end of the gangway, and an opening for ventilation to each stall.

CATTOOZES, see CARTOUCHE.

CATZKHI in Imeritia, see KATZKHI.

CAULICULUS. The diminutive of the Latin *caulis*, the stalk of an herb. Its use by *VITRUVIUS*, iv, 1, in a description of the capital to the Corinthian Order, has not been successfully explained, in consequence of doubts whether the word was meant by him to express one of the eight stalks, each carrying a double leaf, generally productive of a volute and a helix; or

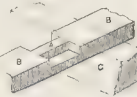


to indicate the double leaf itself; or whether the top of the cauliculus, as a stalk, was meant by *VITRUVIUS* to rise to two-thirds, as B, or only to one half, as A, of the height of the capital: examples of both manners are exhibited in antique models. The description does not accord with the Roman specimens upon which the Italian masters founded their exemplification

ARCH. PUB. SOC.

of the Order, for in these, as C, the cauliculus rises midway, but does not range with the upper row of leaves.

CAULKING, CALKING, or COCKING, COGGING, or CORKING. The act of securing a piece of timber, C, across another, B, the lower piece having a projecting tenon, A, with a corresponding notch or mortice in the timber, C. The tenon in either the upper or lower surface of iron girders, columns, etc., is also so termed.



CAULKING is also applied to the oakum or other material driven into the spaces between planking, when the work is required to be perfectly close; as well as to designate the manner of securing iron mains, pipes, gutters, etc., by cautchouc, wood wedges, oakum, lead, brown paper in red or white lead, iron cement, or other like materials.

CAUNES MARBLES. Caunes, in the department of the Hérault in France, is situated about twelve miles north-east of Carcassonne, and is celebrated for possessing quarries affording several varieties of breccias, grey marble containing encrinetes, all varieties of griotte marble, especially that called Italian, *œil de perdrix*, yellow marble, *marbre cervelas*, and the flesh-coloured marble much employed in the time of Louis XIV and XV, and which are much used in the south of France. They are associated with slates of the transition series. 28.

CAUR, or RUSSY. A chain for land measure used in Malabar, consisting of thirty-two vaums or mars, each equal to 6 ft. 9 ins. *BUCHANAN, Mysore, 4to., London, 1807, ii, 253, 279.*

CAUS (SALOMON DE), born in Normandy or Gascony, was drawing-master to Henry Prince of Wales (died 1614), who employed him to erect a picture gallery to the palace at Richmond before 1610, as appears by the dedication in his publication *La Perspective avec la raison des ombres et miroirs*, fol., London, 1612: the accounts for the building are mentioned in the *ARCHÆOLOGIA*, xv, 17, and an account of payments made to him for works at Greenwich and Somerset Gardens in 1612 is preserved in the *BRITISH MUSEUM, Lansdowne MSS.*, 446. *WALPOLE, Anecdotes*, 8vo., London, 1825, ii, 46, thinks "he was brother of Isaac de Caus and assisted him in building the porticos and loggias of Gorbamby, and at least, part of Camden House near Kensington." He also published *Institution harmonique*, fol., Frankfurt, 1615; *les Raisons des forces mouvantes, etc., et fontaines*, fol., Paris, 1624; *La pratique, etc., des Horloges solaires*, fol., Paris, 1624; and *Hortus Palatinus*, being plans and details of the Electoral Garden and its buildings at Heidelberg, fol., Frankfurt, 1620. According to the *BUILDER Journal*, v, 494, Caus was recommended in 1633 by Inigo Jones to rebuild the side of Wilton House that fronted to the garden, which was afterwards burnt and rebuilt by Webb in 1648. *AUBREY* says, "Caus performed it very well, but not without the advice and approbation of Mr. Jones; for which his lordship (of Pembroke) settled a pension upon him of, I think, a hundred pounds per annum for his life, and lodgings in the house." *NEALE, Views*, v, ser. 1, states that it was commenced by Caus in 1640, and was rebuilt from designs by Inigo Jones.

ISAAC DE CAUS of Dieppe, published *Nouvelle invention de lever l'eau plus haut que sa source*, fol., translated by J. Leak, fol., 1659, 1701, 1704; and *Wilton Garden*, fol., n. d.

CAUSEWAY. (*Fr. chaussée*). A carriage road supported at slight elevations above the surface of any marsh lands or water it may be found advisable to traverse; it differs from a viaduct, which is always of considerable height, with the road supported upon piers and arches; whilst in the causeway the road may consist simply of an embankment or of low retaining walls filled in with earth. *HERODOTUS* mentions a remarkable work of this description formed in the valley of the Nile, being the "northern" causeway made for the conveyance of the stones from the river to the great pyramid at Ghizeh; it occupied ten years in construction and was about 3,000 ft. long, rising to 85 ft. high, but is now only 32 ft.



wide, the outer casing "of polished stone adorned with the figures of animals" having fallen. The Romans constructed several in the valleys of the Danube and of the rivers of northern Italy; there are some remarkable specimens in Holland, and in the fen districts of Cambridgeshire and Lincolnshire, whilst those of Mexico and of China have excited the admiration of travellers. WELLS, *History of the Bedford Level*, 8vo., London, 1830; BERGIER, *Histoire des grands Chemins*, 4to., Paris, 1628; DE PRONY, *Description, etc., des Marais Pontins*, Paris, 1822; HUMBOLDT, *Essai politique sur la Nouvelle Espagne*, 4to., Paris, 1811. BARBACOA. G. R. B.

CAUSEWAY or CAUSEY is also used as the common term for a paved street, but chiefly the roadway of that street; but in Leeds it is only applied to the footpaths. W. R. C.

CAUSIDICUM. The term said to have been proposed by ALBERTI instead of CHALCIDICUM in the description of a basilica.

CAVA, see FIORENTINO DELLA CAVA (ANTONIO).

CAVA (the Latin Macrina or Marcina), a city in the province of Principato Citra, in the kingdom of Naples. It contains a majestic cathedral dedicated to the Visitation; and among many other handsome buildings are eight churches, two monasteries, three convents, a *seminario* and an hospital. The celebrated Benedictine monastery of Sta. Trinità di Cava possessed the richest library and archives in the kingdom; these have been removed to Naples. 96.

CAVEDIUM of PLINY, *Ep.* ii, 17; or CAVUM ÆDIUM of VITRUVIUS, vi, 3-8. This term, literally meaning the hollow part of a house, was the Roman name for a central hall open to all comers (VARRO, *LL.* iv), of which five sorts are described by VITRUVIUS, vi, 3; namely, the Tuscanicum, the Corinthium, the tetrastylon, the displuviatum, and the testudinatum. The last-named was used when the space was not great and was ceiled (VARRO, *LL.* iv), so that dwelling rooms might be made in the story over it: no example has yet been found of this system, and only one has yet occurred at Pompeii of the cavedium displuviatum, which had gutters at the walls to take off the water that fell on the roof; the room was lighted by means of an opening in the roof similar to that prepared at the present time for a lantern; and an impluvium or tank was requisite to receive the water, that would drop through the upright sides of the opening. The cavedium tetrastylon (having four columns) had a pillar at each angle of the impluvium, so as to give support to the beams of the roof sufficient to prevent their sagging; and the roof in this and the remaining varieties pitched to the opening, which was then called the compluvium: examples of this variety are seen in the baker's shop next to the house of Sallust, and one of Championnet's houses at Pompeii; in which town a variety is also found that may be called pseudotetrastyle, as two of the pillars are engaged in a wall. The addition of pillars between the four already named rendered the work a cavedium Corinthium; the house of the Quæstor, the casa Carolina, and the house of Meleager are examples of this variety found at Pompeii. It appears from FESTUS, s. v. *atrium*, VARRO, *LL.* iv, and VITRUVIUS, vi, 3 and 4, and 8, that the cavedium Tuscanicum and ATRIUM were the same thing, namely, a saloon having a compluvium pitching down to the centre of the roof, without any support from the floor: VITRUVIUS gives the rules for its proportions, from 30 to 100 ft. long and from 20 to 70 ft. wide; the smallest example from Pompeii which will be quoted is 27 ft. 6 ins. long by 19 ft. 8 ins. wide, and others range from those dimensions up to 53 ft. 6 ins. long by 31 ft. 8 ins. wide in the house of Fuscus or Joseph II. The last-named author does not give proportions for the *alæ* and *tablinum* under widths of 30 and 20 ft. in the atrium respectively: the name atrium was perhaps not given to the room when it was under 20 feet in width. Opposite views on this subject have been published by MUELLER, *Etrusker*, i, 255; BECKER, *Gallus*, i, 77; and MAZOIS, *Pompeii*.

CAVAGNARA or CAVAGNERA (SIMONE DA), in 1392

finished the model, which was burnt about the beginning of the sixteenth century, for the completion of the cathedral at Milan; and in 1401 supported the innovations suggested by Mignotte. GIULINI, *Memoire*, 4to., Milan, 1760, xi, 449. 27. 62.

CAVAGNI (GIOVANNI BATTISTA), with V. della Monica, renewed or rebuilt in 1574 the monastery and the church of S. Gregorio, also called S. Liguoro, considered one of the handsomest in Naples; he built in 1598 the *monte*, and *banco della Pietà*; and died in 1600; Dionisio di Bartolommeo and Giovan Simone Moccia were among his pupils. 62. 95.

CAVAILLON (the Latin CABELLIO). A city in the department of Vaucluse in France. Some mutilated tombs and other remains of Roman work, including part of a triumphal arch, given in LABORDE, *Monumens*, fol., Paris, 1816, pl. 37-39; the cathedral, dedicated to S. Veran, 1200-1300, with an apse dating from the preceding century, the chapel of S. Veran, 1335-55, and an interesting cloister; with the hôtel de ville, are the only buildings deserving of notice. 28. 50.

CAVALLERIO (AMBRGIO), occurs under the date of 1409 in the list of architects to the cathedral at Milan. 27.

CAVARUBIAS or CAVARRUBIAS, see COVARUBIAS.

CAVASION or CAVAZION. The word used instead of excavation by English writers in the first half of the last century.

CAVEA. The Latin term for various articles, and especially applied to the dens of the wild beasts, which were confined, under the seats of the amphitheatre, to be in readiness for the combats on the arena; as well as to the amphitheatre itself, AMMIANUS MARCELLINUS, xxix, 1; APULEIUS, *Met.* x, 227. In this acceptation it is mentioned as consisting of three parts, ima, media, and summa, divided by two walls, called baltei. In the theatre, the whole of the space for the spectators (*θεατρον*) was sometimes designated by the name *κοίλον*, in Latin *cavea*, it being in many cases a real excavation in a rock.

CAVETTO (It. *guocia*; Sp. *antechino* or *esguicio*; Fr. *gueule* and *gorge* when reversed; Ger. *hohlleiste* or *hohllehle*). A concave molding; also called by workmen a hollow, mouth, and casemate or casement. It is usually employed as a cymatium or crowning member in the cornice of the Roman Doric Order, and has generally a quarter of a circle for its profile.

CAVIL, properly GAVIL, or GAVEL. A name for the SCABBLING HAMMER used by masons in shaping stones.

CAXERI (ABEN EL), see BEN IBRAHIM EL OMAYEH.

CAYART (LOUIS). A pupil of Vauban, entered the Prussian service as colonel of artillery in 1692, and built the French church, 1701-5, in the Friedrichstadt at Berlin, which, at the desire of the congregation, was a copy of the celebrated one by Blondel at Charenton. 68.

CAYON (DON GASPARE) succeeded in 1722 to V. ACRERO as *maestro-mayor* of the cathedral at Cadiz, and by leave of the chapter resided at Guadix, to superintend with his brother Josef the construction of the cathedral in that city. After 1753 the works at Cadiz were superintended by his nephew Torquato. Gaspar died in 1762. 66.

CAYON DE LA VEGA (DON TORQUATO), born at Cadiz in 1727, was the son of the above named Josef, and pupil of his father and of his uncle Gaspar. For the latter he conducted as *aparejador* the works at the cathedral of CADIZ from 1753 until the death of Gaspar. From that time Torquato, as *maestro mayor* of the cathedral simplified the designs prepared for that fabric, commenced 1784 the *puerta del tierra*, built 1780 the church and hospital de *Misericordia*, the hospital of S. Josef, the theatre called *el principal* 1762-84, designed the churches of S. Jose and of S. Pablo, both built in 1787, and all at Cadiz; built the *casas capitulares* of the Isla de Leon, the parish church at Chiclana, and that outside the walls of Cadiz; finished the collegiate church and other buildings at Jerez de la Frontera, and many works in the neighbouring towns, and died 14 January 1784. He was a member of the Royal Academy of S. Fernando. T. J. de Benjumea, his nephew, and M. de Olivarez were his pupils. 66.

CAZAN, in Russia, see KASAN.

CEBRIAN (PEDRO) in 1175 was *maestro de la obra* to the cathedral at Leon in Spain; the rebuilding of which was commenced in 1199. 66.

CECCA or CICCÀ, see ANGIOLO (FRANCESCO D').

CECCO (ANDREA DI) of Sienna, occurs under the date 1356 in the list of architects to the cathedral at Orvieto. He was succeeded in 1360 by Paolo di Matteo. 67.

CECROPIUM (Gr. *κεκρόπιον*). The name of the chapel or adjunct formed as a sepulchre of Cecrops by the Caryatide portico with the crypt below, to the Erechtheion at Athens.

CEDAR. This name having been given to trees of very different natural orders, has occasioned much confusion.

1. *Abies cedrus*, cedar of Lebanon fir; the deodara and others.
2. *Arthrotaxis selaginoides*, cedar or pencil pine; mountain ravines and gorges of Van Diemen's Land, and high table land about 4000 feet above the level of the sea.
3. *BIGNONIA leucoxylon*, white wood or white cedar of Jamaica.
4. *BUBROMA guazuma*, bastard cedar of the West Indies.
5. *CALLETRIS*, formerly called *THUJA*, or white cedar of the north coast of Africa; used by the Moors.
6. *CEDRELA*, the red cedar or toon wood of New South Wales, Honduras, Jamaica, and the East Indies.
7. *CUPRESSUS thyoides*, the white cedar of North America.
8. *FLINDERSIA australis*, red cedar of New South Wales.
9. *ICICA altissima*, cedar of Guiana.
10. *JUNIPERUS*, red or pencil cedar of North America.
11. *MELIA azederach*, white cedar of New South Wales.
12. *OXYCEDRUS*, or *JUNIPERUS*.

13. "What near Irkutsky is called the Siberian cedar is a large tree which never sheds the leaf; it is white and smooth, but has not the least smell of cedar. They use it chiefly in building houses, and it makes the finest white floors and freest from knots of any wood I know. The leaves are like those of a pine, but grow in tassels very beautiful." *BELL, Travels from St. Petersburg, etc., 8vo, London, 1764, i, 219.*

*CEDRELA ODORATA*, the cedar of Cuba, Jamaica, and Honduras, is known to cabinet makers as the Havannah or West India cedar. It is imported in logs often 3 or 4 ft. square; is soft and red, resembling the pencil cedar (*JUNIPERUS*); and used chiefly for the inside portions of furniture, as the wood is porous and brittle. The cigar boxes from Havannah are formed of it. It is frequently cut into shingles for roofing. 14.

*Cedrela*, one of the most durable of the Bahama woods, is chiefly obtained from Andros island, and used principally in house building for frames, posts, and girders. The wood is soft, fine, close grained, and rather light, possessing the pink hue and emitting the odour of the common pencil cedar. When full grown the tree is from 16 to 20 ft. long, and 1 ft. in diameter, and is generally cut 10 to 16 ft. long, and from 5 to 8 ins. square.

Another kind, with a curled and shaded appearance, obtained by its growth on a very rocky soil, is used for picture frames and cabinet work.

C. *toon*, red or bastard cedar; *toon*, *Tunga*, *Poma*, or *Jee*, wood of the East Indies and of New South Wales, is like the Havannah, but redder in colour and of a coarser grain. It is very durable, sometimes measures 4 ft. in diameter, and is in common use all over India for joinery and cabinet work. 71.

CEELE. An old English term for a canopy: 'ciel' appears in the English editions of the Old Testament since 1634, 2 *CHRONICLES*, iii, 5, where (synonymous with *tego* 'I cover' in the Septuagint, and *ἐξώσω*, 'I board over', in the Greek version) it replaces 'syle', which occurs in the editions 1536-61, and changes through 'seel' 1568-72 and 'siel' 1578-1633: 'seel' or 'ciel' occurs in Dictionaries as late as 1746; 'ciel' was adopted about 1736.

CEPALÙ (the Latin *Cephaloedium*). A seaport city in Sicily, famous for fine quarries of various marbles, especially lumacelles. Some remains of the ancient city are visible on the summit of the impending rock; such as an edifice, described by NOTT, in the *Annali dell' Instituto*, 8vo., Rome, 1831, iii, 270, pl. 28-29, as now consisting of two doorways constructed in walls of polygonal masonry, and having moldings approximating to those of the Greek school; this is unique of its kind in Europe, and is the only example in Sicily of a style of masonry so common in Central Italy; it is also given in HOUËL, *Voy.*

ARCH. PUB. SOC.

*Pitt.*, fol., Paris, 1787, iv, 92, and in WOOD, *Letters*, 4to., London, 1828, ii, 356. A view of the town (in the buildings of which are many Pointed windows of two lights divided by a single column with black and white bands) is given by GALLY KNIGHT, *Saracenic, etc., Remains*, pl. 29, who has also illustrated the cathedral, dedicated to SS. Salvatore, pl. 10-14, and has described it in *The Normans in Sicily*, 8vo., London, 1830, pp. 217-23. The edifice is 230 ft. long by 90 ft. wide, in a Pointed style mixed with Greek, Roman, and Norman details, and Byzantine mosaic decorations. Its plan is a Latin cross with two western towers, nave, aisles, transepts, choir, and three eastern apses; the nave and transepts have a triforium, but no clerestory; the choir and transepts have groined roofs, but the nave has an open wooden roof; the arches are pointed, except in the great doorway (HITTORFF, *Arch. Moderne*, fol., Paris, 1826) and some of the details; the pillars of the nave have capitals of the time (1130-18 according to the inscription on the west front), but in some the human figure is introduced. The upper part of the building does not appear to have been completed, although the western porch does not seem of earlier date than the thirteenth century; FASO PIETRASANTA, duca di Serradifalco, *Del Duomo di Monreale*, etc., fol., Palermo, 1838, pl. 19, 20. The most remarkable objects in the building are the mosaics; the two white marble chairs inscribed *sedes episcopalis* and *sedes regalis*, on the right and left hand of the entrance to the choir; and the tomb (1359) of donna Eufemia, regent of Sicily. The modern episcopal palace with its old cloister, six monasteries, a convent, and a *seminario*, are the other chief buildings. 96.

CEILING or CIELING. This word, said to be derived from the term *CELE*, has three meanings. The oldest is the wood or plaster work, formerly called *CIELURE*, used to cover the timber, stone, or brick materials forming the *side* of a room: *BOYER, Dict.*, 4to., London, 1753, translates 'to ceil', *revêtir d'un lambris*, and 'a ceiling', *plafond, lambris*; while LUDWIG, 4to., Leipsic, 1791, translates 'to ceil', *täfelu, boiser, parqueter*, and 'a ceiling', *boisage au haut du planchet*. The most modern meaning is the mere *surface* of vaulting or other covering to a room; but the most prevalent, which appears to date from the beginning or the middle of the seventeenth century, is the work applied to conceal the rough floor, or roof over a room. In Yorkshire and Scotland at the present time, as in 1590, the word ceiling or SEELING signifies a partition, as well as a ceiling in the second of the above explanations.

To conceal the rough roof or floor over a room the work is applied either in an *horizontal*, a *sloping* (CAMP-CEILING), a *canted*, or a *curved* form; and each of these may be decorated by beams, by ribs, or by stiles, forming compartments: the exceptions will be explained under CORBEL WORK, FLUTED WORK, and GROTESQUE WORK. The materials have chiefly been stone, mosaic (*Illustrations*, pl. 41 and 42), wood, and plaster; the only metal work of importance, beyond that of which there is Scriptural notice, appears to have been in the treasury of Atreus at Mycenæ, and in the *cella solearis* of the thermæ of Caracalla (described by SPARTIAN, from whose text that of the oratory in the convent of S. Felipe Neri, next the church of Sta. Maria in Vallicella at Rome, was designed), as well as in the portico of the Pantheon, both at Rome. PAUSANIAS, *Descr. Gr.*, i, 22, praises the marble ceiling of the propylea at Eleusis above any other that he had seen: this was in panels, which appears to have been the Asiatic style: the Romans vulgarized it by enlarging the moldings and filling the caissons with alti-rilievi, as seen in the ceilings of the peristyles at Baalbec: where also some of the earliest indications of COMPARTMENT CEILINGS are to be found.

Passing the brick and stone *vaults* of the Romanesque and Pointed styles, with their rib-work, from the simple groin to the fan-tracery of the Tudor period, it must herein be sufficient to glance at *wooden* ceilings; such decorated joists and girders as are given in the *Illustrations*, pl. 5 and 31, will not be noticed. In the Mediæval styles flat, sloping, or barrel timber ceilings



(this last shape, broken into cants, is seen in the Third Pointed period), were usually decorated; with braces in the second case, and with ribs (frequently highly enriched) in any of the three cases. A single ridge along the vault is seen at Halesowen church in Shropshire, and one main and two small ribs on each side of the centre one at Crosby hall (1460) in London; the ribs often have bosses, covering their intersection with other ribs forming panels; such panels are sometimes enriched with foiled work. Among the most remarkable are the ceilings of New Walsingham church in Norfolk; of the hall (1500) at Weare Gifford in Devonshire; of the smaller room at Crosby hall; and of the Trinity chapel in the church at Cirencester in Gloucestershire; this last is given by BRANDON, *Open Timber Roofs*, 4to., London, 1849, who also gives examples of painted decoration: among the oldest flat ceilings of Mediæval work which may be supposed to exhibit their original colouring are those at Peterborough and S. Albans. The ribs of wooden ceilings were occasionally imitations of groined vaultings, as at York; Winchester (in the choir); and Warnington church in Northamptonshire.

Some plastering between wooden ribs, in imitation of vaulting, is however to be seen in some Second Pointed work at Rochester cathedral. The compartment work (excepting its wooden pendants) of the Elizabethan period has a curious affinity to the geometrical work of the Egyptian and Spanish Arabs. Although HARRISON, *Descrip. of England*, in HOLINSHED'S *Chronicle*, fol., London, 1587, p. 187, mentions the use of plastered ceilings in the 'fairest houses', their general use in Europe is comparatively recent. In 1736 it was stated "plastered ceilings are much used in England beyond all other countries, and they have these conveniences with them; they make the rooms much more lightsome; are excellent against raging fire; stop the passage of the dust; and lessen the noise overhead; and in summer time the air of the room is somewhat cooler". The heavy panel work used by Inigo Jones appears to be due to the Italian masters preceding Buonarroti and Raffaello, whose pupils followed their lighter style, as will be seen in the *Illustrations*, pl. 8, and in the works of Taylor and Chambers: the painted Italian and French plain ceilings hardly require any notice. Another style of plaster ceiling was introduced by the dexterity of Italian workers in stucco, whose foliage, etc., are found in houses erected by Le Pautre and Gibbs; and this style lingered in England, as is evident in the structures designed by Stuart, Adam, and Wyatt, until the beginning of the present century, at which period stucco work had been superseded by casting in plaster. In Ireland, however, a fine school of ornamental modeling in cornices, coves, and ceilings, existed for a quarter of a century longer; and such workmanship has revived in Italy, and later still in France.

Plastered ceilings are at present constructed in England by means of laths nailed up to the floor or ceiling joists, or to bracketing where necessary for moldings, paneling, or coves. The lathing is covered in superior apartments with a 'pricking up' coat, a 'floated' coat, and then a 'setting' coat; in ordinary apartments this last is only preceded by one rough coat. The usual way of fixing ornaments where they die into the ground of a ceiling is to cast them with a sufficient ground, and to fix them before the last coat of plastering is laid on; but in France a ceiling so decorated has the ornamental work fixed in spaces left for it when the plain work is done, and the margin and ground of the ornament is filled in by hand, producing an uneven result very displeasing in work near the eye. Sufficient care is not taken in England to wash out ornamental work when a ceiling is repaired: and cutting down cracks shakes the plastering and breaks the key which attaches it to the lathing. The only remedy then is to screw the plastering up to the joists, and to line and paper the plain portion, rubbing down the joints of the paper. The common operation of washing, stopping, and whitening or colouring, only renders the cracks more obvious as soon as the ceiling begins to darken. PLASTERING.

Ceilings of wirework in place of lathing have lately been applied; the wires are about a quarter of an inch apart, and are galvanized or japanned to prevent corrosion. Hoop iron has also been suggested for the same purpose, both for ceilings and partitions.

CEILING FLOOR. The ceiling joists and ceiling attached to the beams of a roof.

CEILING JOIST. A timber of a small scantling secured to the beams of a floor for the purpose of receiving the lath and plastering of a ceiling. These joists are either pulley morticed into the sides of the binding joist, or else notched up, or nailed up, to the under sides of them. The last method is more easily executed, and is considered by some not so liable to cause the plaster to crack. See cuts to BINDING BEAM and JOIST; D is the ceiling joist; F, the pulley mortice.

Ceiling joists are useful as allowing a free current of air through a floor (unattainable in deep joists only), but they are in consequence more likely to allow of the spreading of fire. Fir joists are better than oak, as less likely to warp. TREGGOLD, *Carpentry*, 4to., London, 1828.

CELEER, see SEVERUS.

CÉLÉRIER, CÉLÉRIER, or CELLERIER ( . . . ), designed several works at Paris, as the Wauxhall, continued by Louis, BLONDEL, *Cours*, 8vo., Paris, 1771, ii, 290; the garden of the prince de Soubise in the rue de l'Arcade, 1786, KRAFFT, *Plans*, fol., Paris, 1809, ii, 2; and the theatre des Variétés in the boulevard Montmartre, LEGRAND and LANDON, *Description*, 8vo., Paris, 1809, iii, 99, wherein Célerier is named as the successor in 1807 to Legrand in the restorations at S. Denis; iii, 43, as commissioned to restore the porte S. Denis at Paris in 1809; and iv, 8, to alter the hôtel de Soubise for the archives Nationales, 1809: he also designed, 1810-28, the theatre at Dijon, given in MAILLARD DE CHAMBURE, *Voy. Pitt. en Bourgogne*, fol., Dijon, 1833, i, 1, who states it was modified by Vallot. These works may perhaps be divided between two artists of this name.

CELL. A term of late years expressing the space or pit which recurs between the ribs in a vaulted roof. This application is justified by the use of the word to express the divisions of a honey comb, which dates at least from the time of VIRGIL, *Georg.*, iv, 164. The word *cella* or cell (Fr. *cellule*), as used by his contemporaries for a small bedroom, was applied to the monastic arrangements of the middle ages for the dwelling of a monk separated from his fraternity; for his room in a penitentiary; for his chamber where there was no dormitory; and for any monastery, however large, if it were dependent upon another; D'ACINCOURT, *History* (Painting, cxxxii), fol., London, 1847, and the *Solitudo patrum et eremicul., et famin. penitent*: it has descended to the present time, to convey the meaning of a room of confinement in a prison: sometimes the cell was itself the prison. A distinction has been drawn that a hermit occupied a hermitage and a recluse a cell, see ANCHORAGE: but in a paper on the remains of penitential cells, in the *Reports, etc., of the Architectural Societies*, 1852-3, pt. ii, 299, CHURTON describes the cell of a recluse as "a cottage with a small garden, enclosed within the precincts of the monastery"; "and if the recluse was a priest, he was to have a little oratory of his own adjoining". This author, admitting the practice of burying alive in a cell as a secular judicial punishment, repudiates it as a monastic regulation, and ironically mentions the case of a skeleton found 1722 immured at Thornton abbey in Lincolnshire, but does not mention the more recently discovered cases at Coldingham abbey in Berwickshire, and at Temple Bruer in Lincolnshire (such a mode of interment was used in the case of Amelia of Nassau, MAILLARD, *Bourgogne*, i, 12); BUILDER *Journal*, iv, 125. He however explains the origin, 1100-50, of the dark prison called *Vade-in-pace*, and noticing its existence round Toulouse, cites S. Wilfred's Needle at Ripon, and the penitential cell described by ADDISON, *Account of the Temple Church*, 8vo., London, 1843, p. 74.

# CEILING.

1857 1858 P. 2

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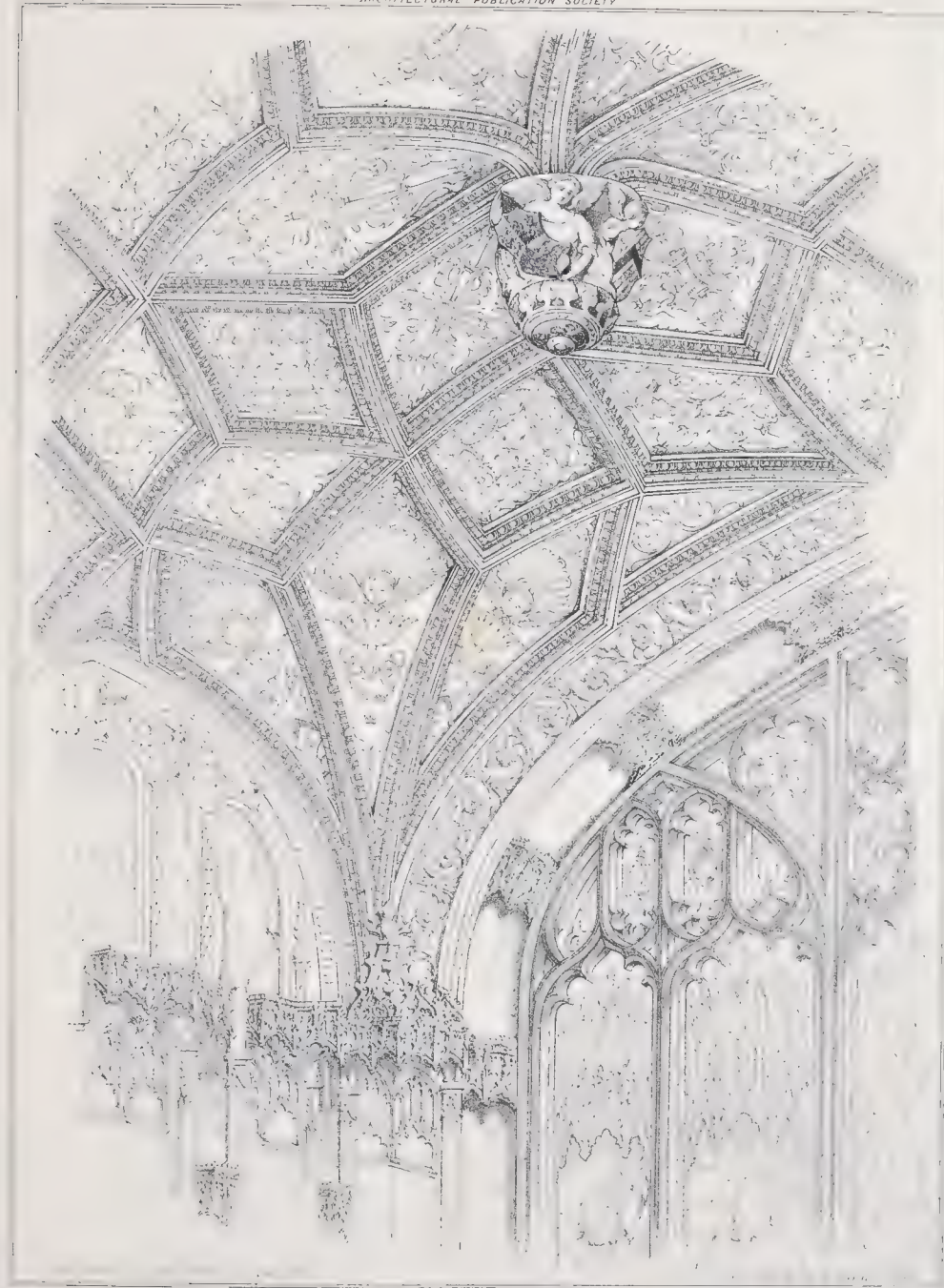
Torre di Santa Ninfa PALERMO. (13<sup>th</sup> Cent<sup>y</sup> Ceiling, Mosaic on gold ground.)

Engraved for the Society by Kell Brothers, 8, Castle St. Holborn Dec<sup>r</sup> 27<sup>th</sup> 1858

J. M. Lockyer, M.B.A. C.F.Kell, lith





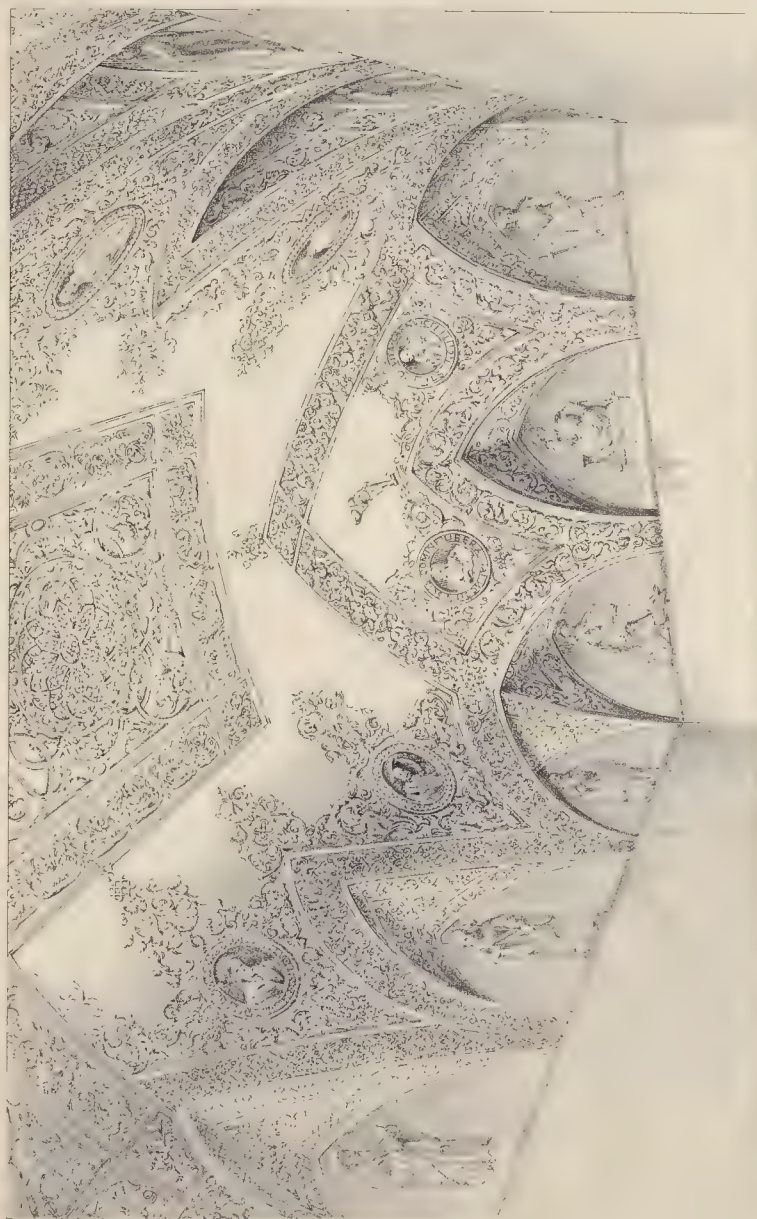


Interior of the Cathedral of St. Peter and St. Paul, Rome.





CELLING  
(MOSAIC)



Y. J. N. I. L.  
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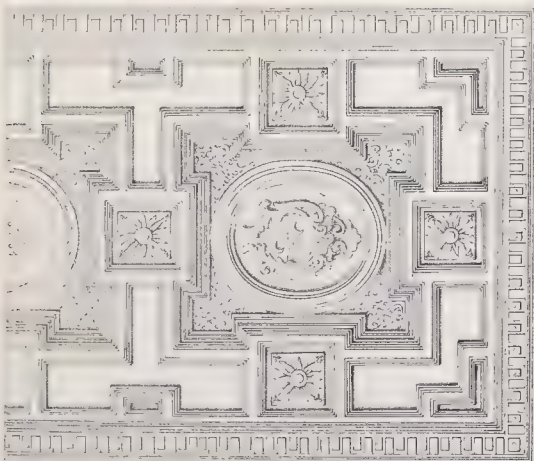
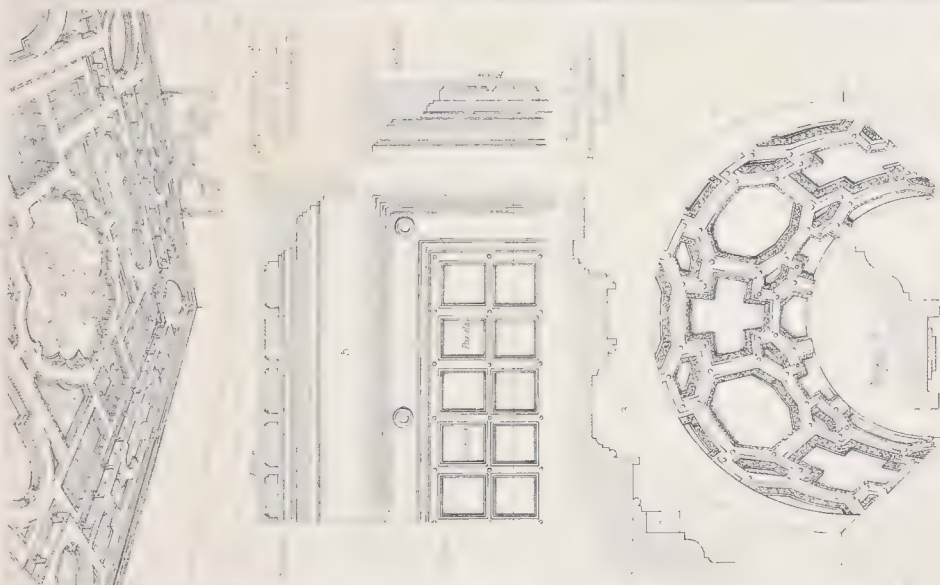
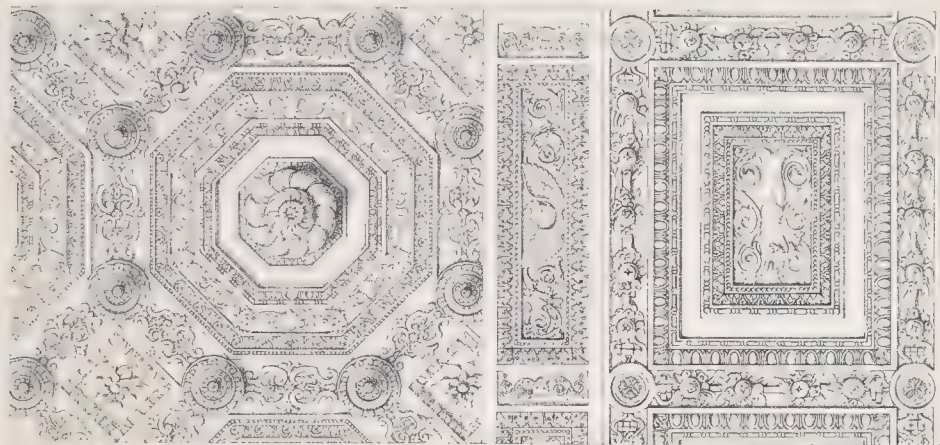


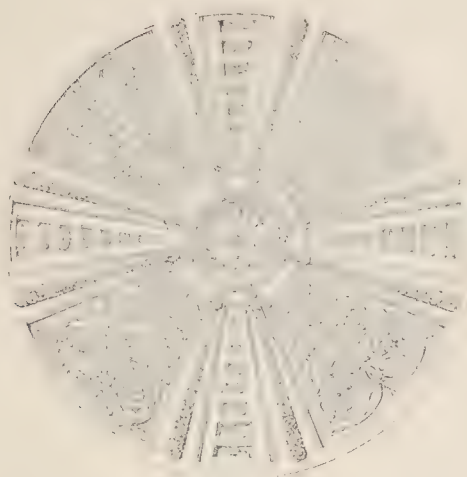
PLATE 1. THE TEMPLE OF VENUS AT BOMBYL.



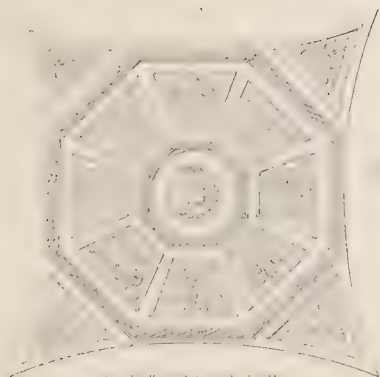




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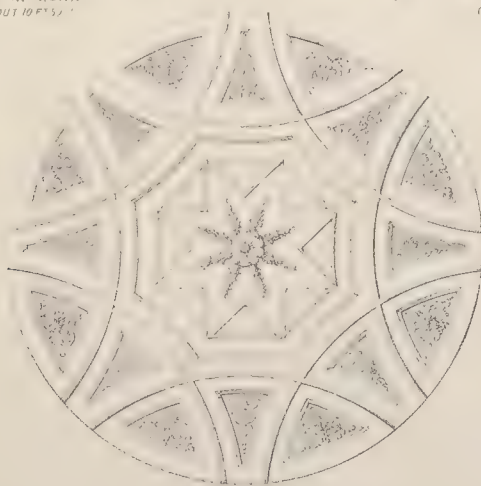
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The cells used in the modern system, as exemplified in the new prisons, are described by JEBB, *On the Construction, &c., of Prisons*, in the PAPERS, &c., OF THE ROYAL ENGINEERS, 4to., London, 1845, vii, 19, who states that a cell 13 ft. long by 7 ft. wide, and about 9 ft. high, is considered sufficiently large for a prisoner undergoing a long period of solitary confinement; that the act 19 George III, c. 74, enjoined in 1778 that such a cell should not be more than 12 ft. by 8 ft., by 11 ft. high, nor less than 10 ft. by 7 ft., by 9 ft. high; and that a French Minister of the Interior recommended in 1841 a size about 13 ft. by 7 ft. 4 ins., by 9 ft. 10 ins. high. The subject of warming and ventilating such cells has been the subject of several papers, including a report by JEBB, 1843, noticed in the *BUILDER Journal*, *passim*; and especially in the report of proceedings at a congress in Brussels, v, 483: wherein cells are mentioned for different purposes, as a parlor-cell for the use of a prisoner not authorized to meet his friends in his own cell, and infirmary and trade cells, of a larger size than the prison-cell, as well as reception and punishment cells, which need not be larger than the ordinary ones.

CELLA. This term in its primary use meant a store room, VARRO, *L. L.*, v: afterwards any one of several small rooms or closets clustered together, COLUMELLA, i, 6; CICERO, *Phil.*, ii, 27; VIRGIL, *Georg.*, iv, 164; VITRUVIUS, vi, 10, speaks of the servants' bedrooms as *cellæ familiaris*, as they were called in opposition to the *cubiculum* or master's chamber: the bath room in the *balneæ*, see *Detached Essay*, BATHS, &c.; and lastly the internal building (or part confined by the walls, whether such part were hypæthral or otherwise) of a temple. As *naos* and *domos* were applied not only to the ædes or temple generally, but to the cella or *secos* particularly, the terms *pronaos* and *opisthodomos*, or anticum and posticum, respectively denominated in the Greek and Latin languages the portions cut off by cross walls from the *naos* or cella; which last in this acceptance had several epithets used as synonyms, for example *ἄστρον*, not to be trodden, which properly only applied to a closed cella, such as that of the temple to Jupiter Lyceus at Megalopolis; and *ἄστρον*, *ADYTUM*, not to be entered, applied when the cella only contained the image of the deity, the altar being placed in the *pronaos* or elsewhere within the *peribolus*. Every temple had but one cella, excepting in cases such as the three, supposed to have been parallel to each other, at the temple to Jupiter Capitolinus at Rome; or such as the unique double storied one at Sparta; the Erechtheion at Athens; the temple of Somnus and Apollo Carneius at Sicily; of Venus and Mars, near Argos on the road to Mantinea; of Æsculapius and Latona at Mantinea; of Juno Eileithyia and Sospolis at Olympia; and of Venus and Rome at Rome. VITRUVIUS, iv, 4, states that the *cella* should be a quarter longer than its width, but this does not appear to be the rule in ancient examples; no notice is taken by him of the introduction of columns into it: an exception, however, to the general rule is afforded by the presumed temple to Ceres at Eleusis, which is wider than its depth, and had a double range of two tiers of columns (PLUTARCH, in *v. Pericles*), of which remains were found, running across the back, and these were probably repeated across the front portion of the cella. The floor of the cella in Greek temples was almost invariably above that of the portico; never below it; the sinking in that at BASSÆ deserves attention: the Parthenon is probably the only temple in which the pavement of the cella is level with that of the anticum and posticum; and in some instances, as at Agrigentum and Paestum, the ascent to the cella is considerable.

CELLAR (*It. celliere, cava, cantina*; *Sp. sotano*; *Fr. cellier* if only half sunk in the ground, *cave*; *dim. caveau*; *Ger. keller*). The name given to a place, generally underground, used as a store-room for wood, coals, wine, beer, &c. The more a cellar is underground the better the beer keeps. In some cases the cellar is an excavation, as at Ivry near Paris, where one country house has a cellar capable of containing 100,000 hogsheads of wine. The cellars of the Champagne district, such as those at

Chalons sur Marne, are well described in the *HOUSEHOLD WORDS Journal*, 1855, but even these are inferior to the cellars in some of the Italian palazzi, such as that with its noble staircase described by CASTELLAMONTE, *Venaria Reale*, fol., Turin, 1674, and to those of the north of Europe, and of some houses in England, erected when carousals were held in them by men of the highest rank: KING, *Observations on Ancient Castles*, given in the *ARCHÆOLOGIA*, vi, 348, describes one of less extent at Haddon hall in Derbyshire; and TURNER, *Some Account*, 8vo., Oxford, 1851, p. 14, explains the Saxon and Norman use of the cellar above ground as a store-room, brewery, and stable, over which was the solar or private chamber.

Wine cellars of importance, as at the Docks, require an even and moderate temperature, *i. e.* never less than 55°; this is obtained by making the walls and arches double, so as to leave a space like that in the walls of an ice-well; or in dwelling houses, by placing them between the back and front kitchens, and if requisite by supplying a heating apparatus with water from the kitchen boiler. In the Halle aux Vins at Paris the cellars, which are above ground, and have double walls, vaulting, and doors, are considered to answer extremely well, besides being more convenient for getting casks in and out than cellars underground. The dryness of all cellars is of the first importance.

#### WINE BIN. COAL CELLAR.

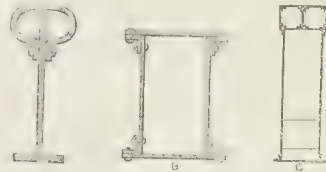
Wine and Spirit Casks.	Gallons	Height, In. Less	Greatest width	Beer Casks.	Gallons	Height, In. Less	Greatest width
Anker ....	10	21	18	Firkin ....	2	21	16 1/2
Bundettof ..	20	27	20 1/2	Kilderkin ..	18	25	21
Barrel ....	31 1/2	30	24	Barrel ....	30	31	26
Tierce ....	42	33	26	Hogshead ..	54	36	28
Hogshead ..	63	38	30	Punchoon ..	72	42	36
Punchoon ..	84	42	32	Butt .....	108	52	43
Butt or pipe	126	48	34				
Tun ..... 204	62	46					
Butt, Sherry	54			Ale barrel ..	32		
Pipe, Port ..	57						

CELLULAR BEAM. A newly introduced application of wrought iron to the purposes of girders and beams, in which wrought iron plates are riveted with angle irons, in the form of a series of longitudinal cells with occasional cross struts. Such beams derive their strength from the rigidity produced by this peculiar form, and from the bulk of the metal being disposed in the manner most fitted to resist the strain. This application of malleable iron resulted from the extraordinary conditions imposed in the construction of the Conway and Menai bridges on the line of the Holyhead railway. For situations in which it is necessary to support heavy permanent or rolling weights over openings of considerable span, there can be no doubt of the superiority of cellular beams over cast iron or trussed girders, not only on account of their greater strength in proportion to bulk and weight of material, but also on account of the greater security resulting from the tenacity, as well as the more perfect manipulation of wrought iron, compared with the liability to flaws and unequal resistance which occur in cast iron, especially in castings of great dimensions.

The experiments upon which the practice of engineers and architects in the application of these beams is founded, are recorded in FAIRBAIRN, *Conway and Menai Tubular Bridges*, 8vo., 1849; in the Report of the Commissioners upon the *Application of Iron to Railway Structures*, 4to., 1849; CLARK, *Britannia and Conway Tubular Bridges*, 8vo., London, 1850; and in FAIRBAIRN, *On Cast and Wrought Iron*, 8vo., 1854. In all cases where the efforts to be resisted are great, it would be best to follow the principles deduced from the observations and the analytical reasoning founded upon them by Messrs. HODGKINSON, WALLIS, and STOKES, in England, and by Messrs. LOVE, MORIN, and others in France. For ordinary purposes the empirical rule mentioned by CLARK (vol. i, p. 196), will be found sufficient; viz., "to make the depth equal to one-sixteenth of the length; to calculate the dimensions of the lower flange so that the tension shall not exceed five tons on the square inch, taking the tension at twice the sum of the load to be carried



and of the weight of the beam itself; to make the sectional area of the top flange one-fourth more than that of the bottom, and the sectional area of the two sides equal to about half the area of the bottom;" the width of the cell will usually be regulated by accidental circumstances, but need not follow any definite rule.



A and C, Cellular Beams; B, Box Beam (see that article).

G. R. B.

CELLULAR ROOFING TILE, see BORIE.

**CELTIC ARCHITECTURE** Until a recent period the inquiry as to what really was Druidical, Pictish or Celtic, has been much encumbered by doubts as to the previous and subsequent occupancy of the territory in which the so-called Celtic remains have been found; and by the very loose nomenclature which has been used. A paper by THOMAS, entitled, *An Account of some of the Celtic Antiquities at Orkney*, given in the *ARCHÆOLOGIA*, xxxiv, 88, is terminated with the remark that "the object of this paper is to put the archaeologist in possession of a store of facts which are free from certain sources of confusion, from their occurrence in an isolated district. In Orkney it is believed we have neither Roman nor Saxon elements to interfere with our investigations; and from the industry of the northern archaeologists, we have so much information of the manners and customs of the Scandinavians from the tenth century, that we are in no danger of confounding their (the Scandinavian) antiquities with the Celtic."

LUKIS, *Megalithic Sepulchres in the Channel Islands*, read at the Society of Antiquaries 1853, and given in the *CIVIL ENGINEER Journal*, xvi, 432, has proposed a series of terms which avoid the confusion that has arisen in giving the same name to several things: thus we should speak of a monolithic *menhir*, and ortholith, parallelith, or cycloolith *menhirs*; of *dolmens* and *demi dolmens*; of simple or compound *cistvaens*; of the *cromlech*, and of *peristalithic monuments*, with a clear idea of the use and signification of the object. In the *pseudo-Celtic* or transitional division of this classification, we have the *cyclo-trilithic*, *monocamaral*, *polycamaral*, and *microlithic* or *galgal* monuments, with the *cairn*, the *rocking stone*, and the *needle rock*. The names usually given to this class of remains are *Menhir*, *Peulhan*, *Dolmen*, *Trilithon*, *Tolmen*, *Gallery* (Fr. *allée couverte*), *Altar*, *Pierced stone*, *Rocking stone* or *Logan*, *Tumulus*, *Cromlech*, *Cistvaen*, *Circle*, *Cairn*. AVEBURY, CARNAC, STONEHENGE, etc.

BARAILLON, *Recherches sur les Mons. Celt.*, etc., de France, 8vo., 1806; CAMBRAY, *Mons. Celt.*, 8vo., 1805; MAUDET DE PENHOET, *Recherches Hist. sur la Bretagne*, 4to., 1814; KEYSER, *Antiq. Sept. et Celt.*, 12mo., 1720; MAHÉ, *Antiq. de Morbihan*, 8vo., 1825; *Mémoires de l'Académie Celtique*, 8vo., Paris, 1807-10; BOURASSÉ, *Arch. Chrétienne*, 8vo., Tours, 1852, and *Rapports entre les Mons. Celt.*, etc., 8vo., 1843; FREMINVILLE, *Antiq. de la Bretagne*, 8vo., Brest, 1832-37; ARNAUD, *Mons. Religieux, etc., au Poitou*, 4to., Niort, 1840; BRETON, *Mons. de tous les Peuples*, 8vo., Bruxelles, 1844-6; LEGRAND D'AUSSEY, *Mém. sur les Sépultures Nationales*, 4to., Paris, vii; GAILLHARAU, *Monuments*, 4to., 1842-52; COMITÉ HISTORIQUE, *Bulletin*, and *Instructions*.

DOUGLAS, *Nenia Britannica*, folio, 1793; CAMDEN, *Britannia*, fol., 1607; HIGGINS, *Celtic Druids*, etc., 4to., 1827; CHARLTON, *Chorea Gigantum*, etc., fol., 1725; BRYANT, *Ancient Mythology*, 2nd edit., 8vo., 1807; WOLLAN, *Account of the Orkney Islands*, 8vo.; MARTIN, *Desc. of the Western Islands*, 2nd edit., 8vo., 1716; KING, *Monimenta Antiqua*, fol., 1799-1806; DAVIES, *Celtic Researches*, 8vo., 1804; WRIGHT, *The Celt, Saxon*, etc.,

8vo., 1852; TAYLOR, *Cromlech, etc.*, in the *District of Sorapur*, 1853; BLIGHT, *Antiq. in West of Cornwall*, 8vo., 1856; CORTON, *Stone Circles, etc.*, in *Cornwall*, 4to., 1827.

**CELTIC MARBLE.** One of the marbles most prized by the ancients; it was black with white veins. PAUL. SILENT., *Ephr.*; GIBBON, *Decline*, ch. xl.

**CELTIS AUSTRALIS**, the Lote or Nettle tree (Fr. *micocoulier* and *bois de Perpignan*), is reckoned among the largest timber trees of the south of Europe. The wood is one of the hardest known, compact, being between oak and box for density, heavy, dark in colour, very durable, free from flaws, and taking a high polish. It is said to be used for carving. *C. occidentalis* is very similar; the timber being tough and pliable is imported for the frames of carriages.

**CEMENT.** A simple or compound substance used in a soft or fluid state as a medium for uniting or for assisting in producing the adhesion of surfaces of various materials. GLUE, MORTAR, PUTTY, and SOLDER, are each a species of cement, and will be treated in separate articles. The word cement, although usually applied to all the mortars and similar compositions used for binding together the materials of which walls are constructed, has latterly been limited exclusively to such of them as harden rapidly when exposed to atmospheric influences, or when used under water; some of which are also employed as a cheap method of forming architectural ornamentation on the surface of a building. Ordinary mortars and limes are properly CEMENTITIOUS MATERIALS; but technically that term is only understood to apply, 1, to hydraulic cements obtained from the natural substances in which lime is found in combination with clay (a list of which is given in BRARD, *Description*, 8vo., Paris, 1833, p. 44); 2, to the artificial mixtures of chalk and clay so burnt as to enable them to set under water; 3, to the mixtures of lime and oily substances; 4, to various combinations of gypsum with other substances; and occasionally, 5, to the materials used for the junction of earthenware, glass, iron, stone, etc.

1. and 2. In addition to what has been said with respect to *Roman* and *Portland* cements, under the head of CALCAREOUS CEMENTS, it may be important to observe that the specific gravities of the best natural cement stones are about 2.16; those of the calcined stones in lump about 1.58; and those of the loosely packed powder from 0.85 to 1.00. The specific gravity of the *Portland* cements is at least 1.28. As all this class of materials, in their ground form, absorb moisture from the atmosphere with great avidity, it is customary to pack cements in casks if they be intended to be transported to a considerable distance, or to be kept for any length of time; these casks ought not to contain more than 3½ cwt. each. The *Portland* cements carry, to use a workman's phrase, more sand than the natural or the *Roman* cements; but it would be impossible to affirm any invariable law with respect to the proportions of the respective materials, because the qualities of the raw materials and the results of the calcination differ within a very wide range, and, moreover, the uses to which the cements are to be applied would require to be taken into account. The use of sea sand or of sea water, in combination with either cements or mortars, should be avoided as much as possible; in positions where the efflorescence of the salts of lime would be objectionable, they must be rigorously excluded. The resistance of the best *Roman* or natural cements to an effort of compression varies from 829 to 1,244 lbs. on the square inch; the resistance to a cross strain is said to be 61 lbs. on the square inch; the adhesion to stone, bricks, etc., varies apparently in some ratio connected with the absorbing powers of those materials, provided that at the moment of application they be not so dry as to abstract from the cement the water necessary for its crystallization. The French engineers use to a great extent natural and artificial hydraulic limes, which must be considered to be species of cements; but they would be more appropriately described under *HYDRAULIC LIME*. The well devised system of experimenting in order to test the qualities of the different

kinds of cements employed at the dry docks at Brooklyn, U.S., is given in the *ARCHITECT Journal*, 8vo., London, 1850, ii, 8.

3. Oleaginous cement, or *mastic*, was originally introduced into England by Hamelin, and was largely employed by John Nash, who was among the first to use it, on the front of the Haymarket theatre. Subsequently many other buildings in Regent-street were cemented with mastic, as also most of the houses in King William-street in the city of London, the Union club, Trafalgar-square, the London orphan asylum at Clapton, and elsewhere. It is made by mixing certain proportions of litharge (or the red protoxide of lead) with pulverized calcareous stones, sand, and linseed oil; but the precise details of the manufacture are variable. This material has in general been laid aside.

VICAT, *Traité Théorique et Pratique de la Composition, etc., des Mortiers et Ciments*, 8vo., Paris, 1856. WEALE, *Elementary Treatise on Limes and Cements*, gives a list of authors who have written upon this subject, to which may be added the *REPERTORY OF ARTS*, etc., *passim*; DONALDSON, in *Encyc. Metrop.*, s. v. Stucco; PASLEY, *Limes, Cements*, etc., 2nd edit., 8vo., London, 1847.

BLUE LIAS; ATMOSPHERIC INFLUENCE; CALCAREOUS CEMENT; COMPOSITION; LIME; PLASTERING; POZZUOLANO; TARRAS.

4. The plasters called cements with various names, as KEENE, etc., will be described under their respective titles.

5. Other substances called cements, whether applied in a liquid form through the addition of fluids, or by fusion with heat, will be described under the general heads of GLASS, IRON, and RESINOUS CEMENTS.

G. R. B.

CEMENTARIUS or CEMENTARIUS. The name given by late Latin writers to the constructors of works built in *opus cémentarium*; thus the church of S. Lucien at Beauvais was rebuilt in 1078 by two cementarii, Odo, who designed the towers, and Wimbold, who directed the whole of the works. 56.

CEMETERY (It. *cimiterio*; Sp. *cementerio*; Fr. *cimetière*; Ger. *begräbnitzplatz*). This word, derived from the Greek *κοιμητήριον*, a place of rest, has been adopted in Europe and America as the designation of a burial-ground without a church, i. e. situated at some distance from a parish church: both extra-mural burial-grounds and their arcaded ambulatories appear to have come into use during the thirteenth and fourteenth centuries: in Italy a cemetery prepared with porticos or ambulatories to receive monuments is called a *campo santo*, after the name peculiarly belonging to that at Pisa; the *certosa* near Bologna, consecrated in 1802 as the public cemetery, is extolled as a model. The *ECCLESIOLOGIST Journal*, iii, 129, iv, 9, and x, 155, 338, insists that a cemetery should not be laid out in the modern style of landscape gardening, with serpentine walks and irregular flower beds, but in regular and formal figures. An entrance or lich-gate, a porter's lodge, a tower with a peal of bells, a lich-house or dead-house, a circular chapel with a chancel and communion table, a vestry or sacristy, robing rooms for the mourners, rooms for the palls, hearses, etc., are advocated in that *Journal*; which "recommends a western doorway of large size", and it "may perhaps require a porch to be erected adjoining it"; a churchyard cross, and also ailes to the chapel for tablets, etc., are included. The *BUILDER Journal*, vii, 460, gives a plan showing arrangement of ground, and size of graves for a parochial cemetery, each being 6 ft. 6 ins. long by 3 ft. wide. BONE-HOUSE; CATACOMB; CHARNEL; NECROPOLIS.

CEMETERY BEACON (Fr. *fanal de cimetière*). A light-house, usually placed in graveyards on the continent in the twelfth and thirteenth centuries, with an altar, as at Antigny near S. Savin, in the department of la Vienne in France; as illustrated by DE CAUMONT, *Abécédair*, 8vo., Paris, 1850, p. 286, who also gives the chapel (1237) at Fontevault, carrying a beacon tower. The cemetery at Brescia by Vantini also contains a pharos.

CENDRÉE DE Tournai. A description of artificial ARCH. PUB. SOC.

pozzuolano used in Belgium. It consists of a combination hitherto unexplained, of the small particles of caustic lime, which fall through the fireplaces of the kilns, in which the *pierre bleue* is burnt at Tournai, with about three times as much of the ashes of the very slaty coal employed for the calcination of the limestone. A bushel at a time is taken of this mixture, and is sprinkled with water only sufficient to slack the lime; the whole quantity so treated is then put into a pit and covered with earth, where it remains for some weeks. It is then taken out and well beaten by an iron pestle for half an hour, which brings it to the consistence of soft mortar; it is then laid in the shade for a day or two to dry, and is again beaten until it becomes soft. This is repeated three or four times, until at length it is only just sufficiently soft for use; being applied to brick or stone it forms in a few minutes a very compact mass, and after twenty-four hours acquires a stony hardness. It possesses the property of setting under water, and of acting as a water-tight stucco; *SOCIETY OF ARTS, Trans.*, li, 148. ASHES. 25.

CENDRES BLEUES, improperly written Saunders Blue, is a verditer prepared in three degrees of purity from sulphate of copper: used in oil it becomes green. The same name has been given to one quality of ultramarine, and to a carbonate of copper, also called mountain blue. 9.

CENEDA. A city in the province of Treviso in Austrian Italy. The cathedral dedicated to the Assumption, with a campanile dated 1508, an hospital, a *seminario*, and the episcopal palace in the castle, are large and handsome buildings. 96.

CENIS (CINO DI), with Francesco de Vito, commenced in 1325 the buildings of the Carthusian monastery of S. Martino at Naples. 28.

CENOTAPH, from the Greek words *κενός*, empty, *τάφος*, a grave; in Latin cenotaphium. Any tomb erected as a memorial of a person whose body was buried elsewhere, or not found for burial at all; *THUCYDIDES*, ii, 34; *VIRGIL, Aeneid*, iii, 303; *SUTTONIUS, Claud.*, i.

CENTO CAMERELLE. The name given at present in Italy, in imitation of the Latin *centum cellae*, to any ancient building consisting of one or more ranges of rooms or cells that have generally been vaulted, and were probably only lighted by the doors opening from the corridors; if there were one or more similar upper stories, the corridor, reached by a ladder, was either a balcony on cantilevers, or a vaulted gallery. Those at Baioli are supposed to have been either reservoirs of water to supply the naval forces, or the cellarage of a villa; but *QUATREMÈRE, Encyc.*, s. v. *castrum*, seems disposed to adopt for these the hypothesis of WINKELMANN, with regard to those at the villa Hadriana, viz. that they were a barrack; and cites *GUATANI, Monumenti Antichi inediti*, 4to., Rome, 1784, for the description of those at Otricoli; which he considers is supported by the more recent discovery of the soldiers' quarters at Pompeii.

CENTRE OF AN ARCH OR VAULT (old English, *seyntre*, *synetre*, *synetree*, *syntree*; It. *centina*, *centinatura*; Sp. *cimbra*; Fr. *ceintre*; Ger. *lehr bogen*). The timber framing used to support the materials of an arch during construction. Upon the rigidity of this framing under the load, as well as upon the ease with which it may be struck, the successful execution of the arch or vault depends; and it may be taken as a rule that it is preferable to place the centres as close together as possible, in order that the weight brought upon each of them may be diminished, and the striking rendered more easy; the distance from axis to axis should, indeed, never exceed 7 ft. The frames of a centre are made either to bear directly upon the piers, without any intermediate support; or they may rest upon struts, or even a temporary substructure, which should diminish the clear opening. Upon these frames are placed the boards, or laggings, intended to receive the intrados of the arch: when small materials, such as bricks or rubble stone, are used, these laggings are laid close: when the work is executed in large wrought stones, the laggings are usually placed at inter-



vals. Where a level tie-beam is omitted, so as to leave head-room in the centre above the springing of the arch, such a centre is called a cocket centre.

The Romans occasionally covered the centering with a thick layer of mortar, before the masonry of rough unhewn stones was built upon it, so that when the centering was removed the stones, embedded in the mass of the mortar, kept it adhering to the under surface of the vault: this is to be seen, indicated by the marks of the boards, in a small vault under some of the seats to the theatre at Autun: and many examples of this mode of construction are to be found in Norman work.

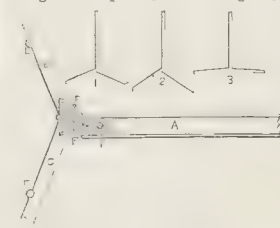
In designing a centre of large span, the important principles to be observed are: 1. That the frames should be put together so as to resolve all the thrusts into a vertical effort upon the points of support; 2. That the frames should be maintained in a vertical position; 3. That the tendency of the centre to rise towards the key, during the construction of the lower part of the arch, should be neutralized; 4. That the centre should be able to be withdrawn without producing any jar upon the masonry, and sufficiently gradually to allow the arch to settle. In executing the arch it is usual to carry up the two sides equally and to weight the crown, in order to avoid an excess of load on either side; and most constructors give a slight additional rise to the portion of the centre intended to receive the key stone, in order to compensate for the sinking occasioned by the compression of the joints of the work. At the celebrated bridge of Neuilly the arch settled about 2 ft. 2 ins. after the centres had been withdrawn; but in more recently constructed bridges, in consequence of the greater skill and care exercised, the proportionate settlement has been far less, and, indeed, when the arches are of a proper form, and composed of small materials set in good cement, the intrados does not seem exposed to any change. The necessity for exaggerating the rise of the wooden centre, in order that the finished arch may retain the desired form, will therefore depend upon the quality of the wood itself, upon the tendency of the framing to vary from its original shape under a load, and upon the nature of the mortar used in the joints. No general rule would include all these modifying conditions.

In striking or withdrawing a centre, it appears desirable that the operation should be commenced before the mortar has had time to set, if the arch should have been executed in wrought stone and ordinary lime employed; if cement should have been used, however, the setting must be completed before the temporary support is withdrawn. In the former case, also, it is necessary that the withdrawal of the centre should be effected gradually, so as to avoid the development of any rapid alteration in the positions of the various parts of the masonry; and in both cases all jar must be carefully avoided. Formerly the system of easing centres consisted simply in driving back the wedges on which they are placed; but it must be evident that in bridges of large spans the weight thrown upon each frame must develop such a resistance to the lateral movement of the wedges, that they can only be driven by great efforts. The French engineers have lately endeavoured to overcome this difficulty by placing the wooden centres upon bags of waterproof cloth, filled with dry sand and emptied through a small neck, in such wise that the flow of the sand through this neck may be regulated at will, or even entirely stopped when the centres are being eased. An account of this mode of easing centres will be found in the number of the *ANNALES DES PONTS ET CHAUSSÉES* for November 1849, or in the supplement to *WEALE'S Bridges*, 1853, p. 105. *PITOT, Mémoires de l'Académie*, 1726; *PERRONET, Mémoire sur le centrement et décentrement*, 4to., Paris, 1809; *GAUTHIEY, Sur la construction des ponts*, 4to., Paris, 1816; *BORGNIIS, Traité élémentaire de construction appliquée à l'architecture civile*, fol., Paris, 1823; *CLAUDEL, Formules, etc., ou aide mémoire des ingénieurs, des architectes*, etc.; *EMY, Traité de la charpenterie*, fol., Paris, 1837; *NAVIER, Leçons sur l'application de la Mécanique*;

*MOSELEY, Mechanics applied to the Arts*, 3rd edit., 8vo., London, 1852; *ROBISON, Mechanical Philosophy*, 8vo., London, 1822; the *ENCYC. BRIT.*, s. v. Bridge; *BALDWIN, Plans, etc., of Machines used in Blackfriars Bridge*, fol., London, 1778; *CRESY, Encyclopædia*, 8vo., 1847; *ROMBERG, Zimmerwerks*, fol., Leipzig, 1846-50, pl. 152-5; *PITROU, Recueil, etc., d'arch. de charpente, etc., construction des ponts*, fol., Paris, 1756; *WILLIAMS, Method of Removing the Centres*, etc., in the *REPERTORY OF ARTS*, 8vo., London, 1817, xxx, 277; *AINGER, Centreing for large Arches*, illustrated in *Transactions of Society of ARTS*, 8vo., London, 1825, xliii, 183; *SIMMS, Practical Tunneling*, 4to., London, 1844; *RONDELET, De l'art de bâtir*, 4to., Paris, 1817; *RORET, Manuel du charpentier*, 18mo., Paris, 1837; *TREDGOLD, Carpentry*, 4to., London, 1828. G. R. B.

**CENTREBIT.** A tool of various sizes, used by joiners and plumbers. It consists of a piece of iron made to fit into a socket in the handle of a BRACE or STOCK, the other end having a centre pin with a cutting blade on one side and on the other a clearing blade. **BIT.** An expanding centrebit is described by *STONE*, in the *Transactions of the Society of ARTS*, etc., 8vo., London, xxxi, 250.

**CENTROLINEAD.** An instrument for drawing lines, which are required to converge towards an inaccessible point, as in a perspective view, or the joints of arch stones. The simplest consists of a T square, with one side of the stock shorter than the other, so that one edge of the blade may be in the centre of the stock, and the stock works against a common jointed rule, as is described by *O'BRIEN, Trans.* of the *SOCIETY OF ARTS*, etc., lv, 13. This is a modification of the system of using three squares, such as figs. 1, 2, and 3, the back of the



A, the blade under the plate B, carrying the arms a and c, moving against the plate E; F, clamping screw.

stocks being cut at the different angles, viz. of  $172\frac{1}{2}$ , another opening only half as much, and the third still less; such fixed angles, with divisions on the sliding limbs, are described by *SHUTTLEWORTH, Trans.*, xlix, 35. These are all more or less variations of the centrolinead described in 1815 by *NICHOLSON, Trans.*, xxxiii, 69, and shown in the illustration, which is in reality a slight improvement on the instrument described by *FAREY, Trans.*, xxxii, 71; in which volume *NICHOLSON* has given a sort of converging ruler for a similar purpose. **ARCOGRAPH.**

**CENTRY GARTH**, see *GARTH*.

**CERAMICS**, or **CERAMIC MANUFACTURE.** A recently adopted generic term, for all the varieties of baked or burnt clay, derived from the Greek word *κέραμος*, potter's earth. It is not desirable here to trace the various steps by which the ceramic art has attained its actual perfection; the reader who is desirous of studying this branch of archaeology is referred to *LABARTE, Illustrated Handbook of the Arts of the Middle Ages*, 8vo., London, 1856; to *BRONGNIART, Traité des arts céramiques*, etc., 2nd edit., fol., Paris, 1854; and to *MARRYAT, Collection towards a History of Pottery in Fifteenth to Eighteenth Cent.*, 8vo., London, 1851. Attention can only be here given to the productions of this art which enter into architectural decoration, and to the natural laws affecting their durability.

*BLASHFIELD, History and Manufacture of Ancient and Modern Terra Cotta*, 12mo., London, 1855, gives a detailed catalogue of the works to which that material may be applied. The term terra cotta, in this case, bears the limited signification of a clay, i. e., an ordinary silicate of alumina, moulded to a pattern and burnt (either with or without a varnish or a metallic glaze) to a point below that of fusion, or imperfect vitrification. The clay which is so treated is adapted for the manufacture of bricks and tiles for roofing and paving; also for bassi relievi,

capitals, ornamental panels, vases, fountains, statues, drain pipes, etc., all of which require different qualities of the raw material, and different modes of treatment in moulding and in the kiln; but almost all of them are included under M. Brongniart's first class, "potteries of a tender paste", that is to say, able to be cut with the knife. He also states that the composition of the clays fitted for these purposes may be described as being of an argillo-silicious nature mixed with lime, and that they are generally fusible in the porcelain furnace.

The bassi relievi, capitals, panels, and other ornamental works executed in terra cotta about the commencement of this century by Messrs. Coade, Budd, Rossi, etc., have resisted the effects of the London atmosphere with remarkable success. In S. Pancras church, for instance, all the elaborate ornamentation, executed by Rossi in terra cotta, remains generally speaking as fresh and as sharp as when placed 1819-22. Coade is said to have used a mixture of Devonshire and Dorsetshire clays with fine sand, pounded flint, and potsherds, which in fact constituted a species of stoneware; but no varnish or glaze was used, nor does it appear that the articles required such protection.

In addition to the remarks upon MANUFACTURE OF BRICK, it may be important to observe, that the earth most fitted for their manufacture is a clay analogous in some respects to the alluvial deposits of the embouchures of large rivers; the very pure clays, however, are subject to warp and split under the effects of a rapid desiccation, or in burning. GERHART states that when the proportions of silica to alumina are as 6 to 4, the clay is too mild; and that when they are as 8 to 2, it is too poor. BRONGNIART appears to consider that the tenuity of the particles, and their mode of combination, have more influence upon the qualities of the clay than the proportions of the constituent chemical elements. The uses to which the bricks are subsequently to be applied must, however, greatly affect the selection of the clays. FIRE BRICK, STOCK, MALM, CLINKER, SUFFOLK, PIERCED, RED KILN BURNED, and BLUE or Staffordshire, bricks.

The clays used for roofing tiles only differ from those used for ordinary brickmaking in the fact that they require to be finer. The ordinary red paving tiles are made of the best and cleanest descriptions of brick earth carefully washed, and moulded with great precision. When more ornamental descriptions of tiles are used, it is customary to stamp a pattern upon the clay in *intaglio*, to fill it in with a different coloured clay, and then to cover the surface with a leaden glaze; the difficulty in this process consisting of the inequalities in the shrinkage of the clay in the body of the tile, and of the ornamental pattern, during the burning. The tiles used for mural decorations, however, are usually made of a coarse paste or body, covered with a finer earth of any desired colour, and glazed with a metallic glaze: some, like those at the Alhambra, have had the pattern in slight relief painted with enamel colours, while others appear to have had only an unburnt glaze.

The principal causes of destruction of all the terra cottas exposed to the action of the atmosphere are, firstly, the solvent action of water, whether in the shape of running streams or of rain, or whether furnished by the capillary action of the molecules; secondly, the efflorescence which takes place in damp situations; and thirdly, frost. In the former cases the soluble materials are absolutely removed, and it becomes essential to select clays which should be entirely free from them, or should at least be converted into insoluble substances by calcination. The destruction superinduced by the efflorescence of any salts contained in this class of materials is of a much more complicated nature than that resulting from a simple dissolution; for chemical changes unquestionably take place in the constituent elements such as to allow the formation of new salts, which tend in crystallizing to disintegrate the whole mass. The recent alluvial clays at the embouchures of rivers appear to be most exposed to this inconvenience, and they should be excluded from all works where durability or sharpness of outline is de-

sired. NITRATES; EFFLORESCENT SALTS. The last cause of destruction to which allusion has been made, viz. frost, depends of course upon the law of the expansion of water in freezing; and the only precaution against it is to place porous, hygometric, terra cottas in positions where they can receive no water, or to cover them by an impermeable varnish or glaze. In the case of stove tiles, so much used in Northern Europe, it is also essential to guard against any inequality in the expansion and contraction of the two descriptions of clay employed to form the body of the tiles and their enamelled surface; and in the case of ceramic objects exposed to liquid acids of any description, to use only such materials as cannot be attacked by them.

Of late years pottery has been employed for drain pipes; and in the formation of arches, with considerable success in positions where it is desirable to prevent the transmission of heat, and to secure lightness of structure. The flues of chimneys have also been executed in this material. HIORT; *Construction of Chimneys*, 8vo., London, 1826. EARTHENWARE; STONEWARE.

EUK, *Traité de construction en poteries et fer*, 8vo., Paris, 1841; KNAPP, *Chemistry applied to the Arts and Manufactures*, London, 1848; THEOPHILE, *Essai sur divers arts, traduction de M. le comte de l'Escalopier*, 1845; REPERTORY OF PATENT INVENTIONS; WILKINSON, *Manners and Customs of the Ancient Egyptians*, 1837; GARGIULO, *Cenni su i vasi fittili*, 1831; LARDNER'S CYCLOPEDIA, *Arts and Manufactures of the Greeks and Romans*, 1835.

G. R. B.

CERASUS VIRGINIANA, wild cherry tree, is one of the largest productions of the American forests.

On the banks of the Ohio it grows from 12 to 16 ft. in circumference, and from 80 to 100 ft. high, with an undivided and uniform trunk of 25 to 30 ft. high. The wood is of an excellent quality and elegant appearance, being of a dull light red tint, which deepens with age; when chosen near the ramification of the trunk it rivals mahogany in beauty; it is compact, fine grained, and brilliant; and not liable to warp when perfectly seasoned; is preferred to black walnut, whose dun colour with time becomes nearly black; and is generally used for furniture, as well as employed in ship building. MICHAUX, *Sylva*, 8vo., Phil., 1819.

C. mahaleb, much used by the French, is called *bois de Sainte Lucie*.

C. vulgaris, common cherry tree, is a hard close grained wood of a pale red brown, growing to the size of 20 or 24 ins.; much used for common furniture, works easily, and takes a fine polish. When stained with lime and oiled or varnished, it closely resembles mahogany.

CERATI (the abate DON DOMENICO), professor of civic architecture in the university of Padua during the last half of the eighteenth century, built the *Specola* or observatory, one of the most celebrated of its kind in Europe; the new magnificent hospital, where the first Jesuits established themselves; and designed the embellishments of the prato della Valle, detailed by MILIZIA, *Vite*, s. n. The palazzi Abriani, Aldringhetti, Moleno, etc., are attributed to him. 68.

CERCEAU. In order to avoid the faults of other biographers of this family, CALLET, *Notice Historique*, 8vo., Paris, 1843, has been taken as a guide; but even he states, on the authority probably of NODIER, *Voy. Pit.* (Normandy), fol., Paris, 1825, ii, 158, that a grandfather, an architect, resided at Orleans, and was commissioned in 1505, with Giocondo, to rebuild the château at Gaillon: this appears to be altogether a mistake, as the names of Du Cerceau and Giocondo are not so given by DEVILLE, *Comptes de dépenses, etc., de Gaillon*, 4to., Paris, 1850. J. W. P.

CERCEAU (JACQUES ANDROUET DU), according to some writers, was the son of a wine merchant at Paris, whose sign the "Cerceau d'or" was made a sort of seignury by his children; but it is more likely that he was born about 1516 at Orleans: D'ARGENVILLE, i, 317, adds that he was one of the young artists who travelled in Italy at the expense of the cardinal d'Armagnac. A confused account of this celebrated artist's books upon architecture with engravings by himself, is given by CALLET, who states that he quitted France as a Huguenot, published at Turin in 1583, and died there in 1592, aged about 76 years. The dedication, however, of the *Plus excel-*



*lents bastimens*, 1576, is not altered in the reprint, 1607, and the reprint of the (third) *Livre d'architecture* has on its title page "pour Jacques Androuet du Cerceau à Paris, 1615", which must refer to a man of a hundred years old, or to a son of the same name. No printed passage in his books intimates that he was employed as an architect, unless in the annual repairs at Montargis, and in the design of the garden to the Tuileries: the confusion which envelopes the history of that palace until 1650 has been felt by CLARAC, *Description*, 8vo., Paris, 1853, who says, pp. 279, 349, that *this* Du Cerceau was employed at the Louvre under Charles IX, Henri III, and Henri IV. This prevalent error is contradicted by the complaints as to age and infirmity made by Jacques Androuet in his dedication, 1572-82, of the (third) *Livre d'architecture* and, 1579, of the second volume of the *Bastimens*, when compared with the dates in the following notice; and with the statement made by D'ARGENVILLE, *Vies*, 8vo., Paris, 1788, i, 320, that of two sons, who were architects, one was much surpassed by the survivor, who was also named Jacques.

J. W. P.

CERCEAU (ANDRÉ, or ANDRÉ DU, called Jean Androuet by MAROT, and Jean Baptiste by CALLET and AICARD, but Jacques by many others); is mentioned as employed by Charles IX, but incorrectly, as appears from a statement in the *Mémoires de Louis GONZAGA, duc de Nevers*, fol., Paris, 1665, ii, 28, 30, who says that in 1575 Henri III, in order to build a country seat near Paris, was obliged to take from the service of de Magny (de Clagny?) a drawing clerk "qui estoit un jeune garçon, fils de du Cerceau bourgeois de Montargis, lequel a esté des plus grands architectes de nostre France"; and states that Du Cerceau made more drawings for, and erected more monastic buildings, churches, chapels, oratories, and altars, than any architect in France during half a century; he also specifies the monasteries built for Henri III, namely, the Capucins, and the Feuillants, both in the rue S. Honoré; the Minims, called Bons-hommes in the bois de Vincennes; and the chapel of S. Esprit for the Penitents (*Blancs-battus*) at the Augustins, besides one for the Minims in the parc des Tournelles, as well as rebuilding the church of Notre Dame at Clery, to which CALLET adds that of S. Etienne du Mont at Paris. Du Cerceau also, according to SAUVAL, *Histoire*, fol., Paris, 1724, i, 232-5, made the model and superintended the works of the pont Neuf, given in BLONDEL, *Arch. Fran.*, fol., Paris, 1752, ii, 11, of which the first stone was laid 31 May 1578; the work, however, was not completed until 1604: DE L'ESTOILE, *Journal de Henri III*, 8vo., Cologne, 1720, p. 25; and 8vo., Hague, 1744, i, 243; who, 470, also mentions, among the Huguenots who abandoned their worldly views, "André Cerceau, excellent architecte du roi, lequel—après avoir laissé sa maison qu'il avoit nouvellement bastie avec grand artifice au commencement du pré aux Clercs, prit congé du roi", with protestations of fidelity, and transferred his services to Henry of Navarre; for whom he fortified in 1589 Meulan (Melun?) and Pontoise, according to the same author, *Journal de Henri IV*, 8vo., Hague, 1741, iv, 289. CALLET names the other appointments and the salary of Du Cerceau; and p. 13, on manuscript authority of some importance, states that Henri IV confided to Bullant the execution of the five first pediments of the gallery of the Louvre on the side next the river, beyond and in continuation of the pavillon de Flore, which had previously, 1596, been entrusted to Dupérac, and was finished by Du Cerceau. CALLET, also on manuscript authority, records that Henri II accepted in the year of his death (1559) from Boccadoro a design for the *hôtel de ville*, and that François Miron, prévôt des marchands in 1606, during the reign of Henri IV, after a mature examination made by Du Cerceau, had the project executed by the latter, with strict injunctions not to alter it. SAUVAL, ii, 127, 195-6, also states that "il n'y avoit point d'architecte qui eut plus de nom que Du Cerceau, car c'estoit lui qui avoit conduit les châteaux de Mouceaux (for la belle Gabrielle d'Estrées, died 1599) et de Verneuil (for Henriette de Balzac), et non seulement qui passoit pour avoir de plus

grandes pensées et de plus nobles fougues—mais de plus étoit l'architecte du roi"; and continues that he built upon the ruins of the hôtels de Condé, de Soissons, and de Montpensier, the corps de logis and wings (of which it is particularly remarked that it was of brick with stone bands), of the hotel commenced in 1612 for Roger de Saint Lary, duc de Bellegarde, afterwards the hôtel Segulier. The same author mentions Du Cerceau as the architect of a house and grounds belonging to the springs at Passy les Paris; and ii, 123, 126, iii, 13, of several large hôtels in Paris, especially that of Charles de Lorraine, duc de Mayenne, in the rue S. Antoine and rue du Petit Musce, which was called afterwards hôtel d'Elbœuf and hôtel d'Ormesson; and of that of Maximilien de Bethune, duc de Sully, in the rue S. Antoine, given in BLONDEL, *Arch. Fran.*, fol., Paris, 1752, ii, 134, it was the first hotel built regularly in Paris, and, numbered 143 in that street, was still standing in 1842: that of le Ragois de Bretonvillers, being 25 rue de Bretonvillers in 1842, is given in BLONDEL, *A. F.*, ii, 130; that of the president de Ligneris, who sold it to Françoise de la Baume, whence it is called hôtel de Carnavalet, which in 1842 was numbered 23 in the rue Culture S. Catherine, was also called hôtel d'Argouges, and although said by SAUVAL, iii, 12, to have been the work of Lescot, it is described by BLONDEL, *A. F.*, ii, 149, as begun by Bullant, continued by Du Cerceau, and finished by Mansard. CALLET adds, the continuation of the tomb of the Valois at S. Denis, after the death of Delorme in 1577 (which was finished by Bullant, and was destroyed in 1719); the completion of the château of S. Germain-en-Laye, which was destroyed in 1793; and the design of the place Royale at Paris. The gallery to the bridge at Chenonceaux, built 1559-89, is generally attributed to a Du Cerceau. The hôtel des Fermes, mentioned by BLONDEL, *Cours*, 8vo., Paris, 1771, vi, 463, was the hôtel Segulier. The hôtel de Sully was afterwards called de Boisgelin. The date of his death is not known.

J. W. P.

CERCEAU (PAUL ANDROUET DU), probably a relative of the above, was a designer and engraver of architectural ornament in 1680. About two hundred of his prints, exhibiting the changes of style of that period, are preserved in the British Museum, 1269, i, 1, 4, 5, and 8.

J. W. P.

CERCIS (Gr. *κερκis*). A term corresponding to the Latin cuneus, employed in the descriptions of the Greek theatre for each wedge-like body of seats in the coil or cavea separated by the *climaxes* or stairways.

CERDANO (DIEGO) was appointed 1627 *aparejador* of the cathedral and alcazar at Toledo, and succeeded 26 July 1640 to Augustin Ruiz, as *aparejador* and *maestro-mayor* at Aranjuez. 66.

CERDO; see VITRUVIUS CERDO (LUCIUS).

CERECEDO (JUAN DE), *maestro-mayor* of the cathedral at Oviedo, built there the church of the Dominican monastery; the aqueduct of los pilares (altered by Gonzalo de la Barcena in consequence of its not having sufficient height and slope); and in 1553 the parish church of Cudillero, repeating that of the above-named monastery, and finished after his death in 1568, at Oviedo, by Pedro de Orna. 66.

CERENZA in Naples, see GERENZIA.

CERES. The patroness of agriculture, of whom the torch, the basket, the corn-ear, the poppy, and the sceptre, were appropriate emblems. Her temple called MEGARON was often built in a grove in the neighbourhood of a town. The only temple of importance dedicated to this goddess was perhaps that at Eleusis, unless the building at Paestum (also called the temple to Vesta) be another.

CERET. A town in the department of the Pyrénées Orientales in France. It is celebrated for a bridge, the highest and widest in that country, which carries the road over the river Tech, from Perpignan to Pratz de Mouillon. It was built in 1336, and consists of a semicircular arch 147 ft. 8 ins. span, of squared stone, the remainder is of brick. It is remarkable for the arches in the haunches and abutments, which last are from 23 to 26 ft. span. This bridge is in good preservation, and

is only 12 ft. 9 ins. wide. NODIER, *Voy. Pitt.* (Languedoc), fol., Paris, 1837, ii, pt. i, pl. 171; MELLING and CERVINI, *Voy. Pitt.*, fol., Paris, 1830, p. 153.

CEREUM, see CANDELABRUM.

CERMENO (DON PEDRO), honorary member of the Academy of S. Fernando at Madrid in 1768, and counsellor in 1770, designed the church of S. Miguel in Barceloneta, executed 1753 by Daniel Ribas; and the cathedral at Lerida. He died 23 May 1792. 66.

CEROMA (Gr. *κίρωμα*). The place where wrestlers were anointed (or elaiothesium, VITRUVIUS, v, 11), and also in later times the place where they contended; SENECA, *De Brevit. Vit.*, 12. The word is used with palaestra by PLINY, *H. N.*, xxxv, 2.

CEROSTATUM, see CANDELABRUM.

CEROSTRATUM. A term introduced in VITRUVIUS, iv, 6, but evidently a mistake, perhaps for CLATHRATUM.

CERRETO or CERRITO (the ancient Cernetum). A city in the province of Terra di Lavoro in the kingdom of Naples. It contains an old church, which until 1818 was cathedral; a collegiate church; and three monastic establishments. 96.

CERTOSA, see CARTHUSIAN BUILDINGS.

CERUSE. A term derived from the Latin *cerussa*, for carbonate of lead, or WHITE LEAD.

CERVELAS, CERVELLATE, or SAUSAGE MARBLE, found in quarries at CAUNES in France. A dark red ground with grey veins and white spots: the original or ancient quarries are supposed to have been situated in the north of Africa.

CERVETERI, or CERVETRI, see CERE.

CERVIA. A city, built 1703 at two furlongs from its original site, in the legation of Ravenna, in the States of the Church in Italy. It has a good cathedral, dedicated to SS. Paterniano and Geronzio, built under bishop Cadolini, an attached episcopal palace, a monastery, a *seminario*, and an hospital. 28. 50. 96.

CESA, see CHIESA (CESARE DELLA).

CESARIANO (CESARE), born 1483, a pupil of Bramante, is said to have finished the present interior of the cathedral at Milan; and published a commentary upon VITRUVIUS, fol., Como, 1521, containing the three well known plates of the geometric method of design adopted for that cathedral, re-engraved with remarks, in HAWKINS, *Hist., etc., of Gothic Arch.*, 8vo., Lond., 1813. He died 1542. VASARI gave an erroneous account of him, corrected in the notes to the *Vite*, Siena, 1791, and by POLENTI, in his life of this architect. 68. 82.

CESENA. A city in the legation of Forli, in the States of the Church in Italy. The cathedral, dedicated to S. Giovanni Battista, was rebuilt 1378-89, in a Pointed style, but the chapel of the Madonna is dated 1782. The other principal buildings are the episcopal palace, next to it; the churches of S. Domenico, of S. Agostino, of Sta. Cristina, built 1800-22, in imitation of the Pantheon at Rome, and of the Servites; a *seminario*; two nunneries, and as many hospitals; the remains of twenty monastic establishments, including that called del Carmine, now a picture gallery; the library erected by Nuni of Fano in the fifteenth century, engraved in MUCCIOLI, *Catalogus*, fol., Cesena, 1780; the fine *palazzo pubblico* or *della Comune*; and the palazzi Chiaramonti, Dandini, Guidi, Ghini, Romagnoli, Locatelli, and Venturelli. The large fountain in the great *piazza*; the bridge, built 1592-1605, of three arches, over the Savio; the cemetery, the best after that of Bologna in the Papal States; and the handsome church of Sta. Maria del Monte, reputed to be a work of Bramante, one mile from the city, deserve attention. 28. 96.

CESSPOOL (It. *fosso*, *pozzo nero*; Sp. *foso*; Fr. *fosse d'aisance*, *puisard*; Ger. *graben*). A receptacle, sunk below the level of a drain from a privy or watercloset, for the sediment which would otherwise choke the drain. The cesspool has been too frequently made merely a dead well, and at best as a dry stined dead well with a cover: but in permeable soils it should be executed so that no injury be done by the filtration of the liquid contents. Until lately no regulations upon this subject existed in England; and the consequence of

this carelessness has been that, in the large towns especially, the quality of superficial well waters has been destroyed: in France, however, the police regulations upon the subject were substantially to this effect. The cesspools of Paris were made about 10 ft. long by 5 ft. 7 ins. wide, and 5 ft. high to the springing of the semicircular head, in the clear, and had a man hole 3 ft. 4 ins. by 1 ft. 2 ins., for the purpose of visiting and repairing them: they were required to be impermeable, and were not allowed to be used without examination by the municipal authorities. Any infiltration from a cesspool into a neighbouring well or cellar, exposed the proprietor of the former to an action for damages; and the architect and builder were both responsible for the space of ten years for the perfect execution of the work: no dead wells or permeable cesspools were allowed to be formed under any circumstances. Fortunately in England the extension of the system of sewerage has rendered the use of cesspools less general than it used formerly to be; but there are many situations in which recourse must be had to them, and in which the above precautions ought to be enforced. ABSORBING WELL; CISTERN; SESSPOOL; TANK; TRAP. G. R. B.

CEUTA. A city belonging to Spain, but situated in Morocco. It contains a citadel and forts, streets covered with sea shingle and gravel, a large cathedral dedicated to the Virgin, a town hall, two monasteries, and three hospitals; the episcopal palace is at some little distance from the town. 96.

CEVEY or KINNEY WOOD of Sierra Leone, grows in great abundance, and possesses the property of resisting the worm, when used in shipping. The internal texture is variegated with fanciful stripes. The tree is cut 15 ins. square, and 20 ft. long. CORRY, *Coast of Africa*, 4to., London, 1807, p. 55.

CHACE, see CHASE.

CHACKED. A term applied in the north of Great Britain to timber notched or halved.

CHAERONEIA (Gr. *χαρώνεια*). An ancient town in Boeotia, the site of which is now occupied by the modern Kapurna, five miles north of Lebadea or Livadia, in Greece. The theatre, one of the smallest in Greece, had two *præcinctiones*; its remains show distinctly the diazomata; the seats were partly cut in the rock; Note to DONALDSON, *On the Form, etc., of the Greek Theatre*, in the sup. vol. to STUART and REVETT, *Antiquities*, fol., London, 1830. A fine specimen of the second division of Cyclopean building, consisting of polygonal blocks with dressed joints, forming a wall which batters, is given by DONWELL, *Views*, fol., London, 1834, pl. 16-17; HUGHES, *Travels*, 4to., London, 1820. MURE, *Tour in Greece*, 8vo., Edinb., 1842, i, 212, mentions the colossal lion discovered in a tumulus, commemorative of a battle, 338 B.C.

CHAILIEE. The name given in Hindostan to a CHAMFER.

CHAILLON (JACQUES DU), *maitre maçon des bâtimens du roi en Bourgogne*, and *architecte de monseigneur le prince* (de Condé), tendered 20 November 1662 to erect the bell tower of the church of Notre Dame at Bourg, from the designs made by Maugras of Lyon: the contract is given by BAUX, *Notice, etc., sur l'église*, 8vo., Bourg, 1849, p. 150.

CHAILLOU, sometimes written CHARLHOU and CHAYLOWE (WILLIAM DE), in 1324 surveyor of the king's works, was appointed 1327-8 clerk of the works to the new chapel at the palace of Westminster, and to the tower of London, and was succeeded 3 January 1329 by William de Kelleseye. *Rot. orig. abbrev.*, ii, 5, rot. 8, as cited by BRITTON and BRAYLEY, *History*, 8vo., London, 1835, pp. 125, 199, 244. 19.

CHAIN. The present usual measure of length employed by land-surveyors: 100 links = 4 poles, = 66 feet, = 22 yards. It is commonly called Gunter's chain, having been first used in England by him, who mentions it in his *Description*, 4to., London, 1624, and adds, "as 10 is to the breadth in chains, so is the length in chains to the content in acres." The chain consists of a hundred straight links of rod iron about  $\frac{1}{8}$  inch in diameter, joined by three rings (formerly by one ring) so as to be 7.92 inches long between centres, and a piece of brass,



marked to shew the length from the end of the chain, is fastened at every tenth link. A chain of 100 feet, having the links a foot in length, is now becoming usual. A set of ten ARROWS for marking the distances should always accompany the chain. A chain of double the length is sometimes used. A chain of iron rods, each with its copper junction ring, being equal to a *pied de roi*, was formerly used in France, of 60 or French 66 feet (ten or eleven *toises*) in length. The new chain is ten, or twenty, or twenty-five *mètres* in length. An iron chain has been employed for similar purposes from time immemorial in India, CAUR; in that country as in Europe it is difficult to find two which agree in length after a short period of usage, care not being taken to verify the length from time to time.

**CHAIN.** A succession of links, each of which, except the first and the last, joins two others: in buildings a chain is frequently used with an ANCHOR. The link may be a ring, or a bar of any length with a ring or eye at each end, or a bar with a hook at one end and an eye at the other; links finished with eyes have been either joined by links furnished with hooks, or by *keys*, *pins*, or *wedges*. Chains of stone have been made to exhibit a display of magnificence and patience; such are seen at Bejapore and Chillambaram.

**CHAIN, STRENGTH OF.** Much depends upon the shape of the links; and so long as the strain to which it is exposed can be kept in a direction coincident with the axis, the strongest form will be obtained when they will have straight sides between the points of tension. But, as the strain often acts in a direction perpendicular to the axis, it is essential to introduce a stay which should maintain the sides of the links invariably in their position, and to resist any unequal extension or compression of the metal in the sides. It rarely happens that the chains used for hoisting building materials are wanted of such strength as to require the introduction of these cross stays, but in ships' cables they are always placed, and are made of cast iron. It may be important to mention that on the occasion of a chain cable, on board a vessel in the Pacific, being struck by lightning, the electric fluid scored the wrought iron with a regular groove, although not in the line of its shortest course, but entirely avoided the cast iron.

The formula given by MOSELEY, *Engineering*, etc., 8vo., 1843, to determine the conditions of rupture of a bar suspended vertically, may be adopted in calculating the resistance of a chain intended to be used for hoisting; the other dynamical efforts to which chains are exposed will be more correctly discussed under SUSPENSION BRIDGE. MOSELEY calls *K* the section of the link in inches, *L* the length of chain, *μ* the weight of each cubic inch, *W* the weight suspended, *τ* the tenacity per square inch, and assumes that the chain should be able to resist a strain equal to *m* times *W*, and *m* times the weight of the chain; then the resistance would be

$$K \tau = m (\mu L K + W) \text{ or } K = \frac{m W}{\tau - \mu m L}.$$

The tenacity of chain iron is usually taken at 21½ tons to the square inch. NAVIER, *Leçons de Mécanique appliquée*, etc.

The following table is taken from DWYER, *Hydraulic Engineering*, 8vo., Dublin, 1847, p. 107.

G. R. B.

Strength of Ropes and Chains.

Diameter of a chain in inches	Proved to carry	Weight of 1 foot of chain in lbs. avo.
3	1	1.08
4	2	1.5
5	3	2.0
6	4	2.7
7	5	3.3
8	6	4.0
9	8	4.6
10	9	5.5
11	11	6.1
12	13	7.2
13	15	8.4
14	18	9.4

**CHAIN, CHAIN BAND, BANDAGE.** (It. *armatura*; Fr. *chainage*.) The names given to an iron CHAIN inserted at the

junction of walls; or round a building, either outside of, or let into, the masonry to prevent the walls from spreading outwards.

**CHAIN BOND or PLATE.** The name given to the BOND COURSE of timber, which has prevailed since the employment of it by the Romans to the present time, as a part of construction in masonry and brickwork; VIOLLET LE DUC, *Dict. s. v. Chainage*. The term was applied to the bond timber of large scantling laid at various heights in walls; such timber is now almost if not entirely superseded by iron hooping. When the use of iron became general, the architects of the mediæval period, seeing that bond timbers had perished, used iron in its stead, whence the term chain bond is applied to a bar of iron when used for tying work.

**CHAIN COURSE.** A BOND COURSE formed of blocks of stone, generally "through stones", with one or more cramps connecting each pair; three courses of such work form the great string course of the choir (1195) of Notre Dame at Paris. Half a century later, a complete chain, used at the Ste. Chapelle, consists of cramps with an eye at one end and a hook at the other, the cramps forming a continuous chain of metal let into a groove in the masonry and run with lead.

**CHAIN TIE.** Iron employed instead of timber to connect the heads of pillars while vaults and arches are being constructed. Such ties during the thirteenth and fourteenth centuries were formed of bars furnished alternately with hooks and with eyes, the usual application being to drop the eyes of a bar on to the hooks of a fixed one. In the fifteenth century, the danger of laying iron in masonry being perceived, architects laid, transversely or longitudinally over the vaultings, free chain-ties with eyed links or bars fastened together by keys or wedges. The modern application of chain-ties may be traced from the network of bars employed in floors by French architects of the seventeenth and following century, to iron joisting, and to the rods used in England to secure falling brickwork. ANCHOR. Some experiments on the strength of hooked iron ties are detailed in the *BUILDER Journal*, x, 199.

A TENSION CHAIN-NET FLOOR AND ROOF for spans of 500 ft. is described by W. B. ADAMS in the *BUILDER Journal*, x, 702.

CHAIR, see THRONE.

**CHAITYA CAVE.** The name given to such of the rock cut temples of India as belong to the third class of Buddhist monuments enumerated by FERGUSON, *Picturesque Illustrations*, fol., London, 1847, p. 15; "*chaitya* meaning an object of worship, whether an image, a tree, an edifice, or mountain." This author observes that such caves "resemble, in almost every particular, both of form, size, and purpose, the choirs of Gothic churches of the eleventh or twelfth centuries; the DAGOBA occupying the place of the altar, and being, like it, strictly a relic shrine": and in the *Illustrations of Rock-cut Temples*, fol., London, 1845, p. 6, 32, he states that all these caves consist of an external porch, or music gallery, an internal gallery over the entrance, a centre aisle (or nave), which is always at least twice the length of its breadth, and is roofed by a plain wagon vault; to this is added a semi-dome terminating the nave, under the centre of which always stands a daghoba or chaitya. A narrow aisle always surrounds the whole interior, separated from the nave by a range of massive columns. The aisle is generally flat roofed, though sometimes, in the earlier examples it is covered by a semi-vault. In front of the more modern daghobas there is always a sculptural niche containing a figure of Buddha with his attendants. Across the front there is always a screen with a gallery over it,—in this there are three doors; one, the largest, opening to the nave, and one to each of the side aisles; over this screen the whole front of the cave is open to the air (forming in height) one vast window, stilted so as to be more than a semicircle, or generally of a horse-shoe form; see plates 7, 8, 3, 11, and 13. Among the group of caves at Karli, a chaitya cave, the finest of its kind in India, is 102 ft. long by 45 ft. wide, with a wooden roof. At Ajunta the ninth 45 ft. long by 23 ft. wide; the tenth 94 ft.

long by 41 ft. wide; the nineteenth 46 ft. long by 23 ft. wide (the plans of the two last are given in pl. 4 and 3 of the text to the last named work); and the twenty-sixth, 66 ft. long by 36 ft. wide, are chaitya or daghoba caves. In some cases the ribbing to the roof is of stone, in others, as at Karli, it is of wood; the tenth cave, just named, combines both methods, the ailes being of stone, whilst the nave has been ornamented with wood; the nineteenth has a triforium wall with figures of Buddha in niches; the roof is ribbed in stone. At Kannari the chaitya cave is 88 ft. long by 40 ft. wide (a plan occupies pl. 8 of the text cited). At Dhumnar are several such caves, one especially, the Bheem Sing ka bazar, is a combination of the chaitya cave and vihara; the nave has no ailes, and is only 30 ft. long by 15 ft. wide, with a rib-vaulted roof. Of the other three, one has a rib-vaulted roof, but two have square flat roofs. At Ellora the only chaitya cave, called the Visva karma, is 83 ft. long by 43 ft. wide, has a triple or Venetian-like window, and a court yard 70 ft. square, with a colonnade on three sides. **BUDDHIST ARCHITECTURE.**

**CHALCE** (Gr. χαλκή). The name given to the splendid vestibule built for Anastasius I, 491-518, in the palace at Constantinople, by Ætherius. PROCOPIUS, *De Edif.*, i, 10.

**CHALCIDICUM.** A name, derived from the city Chalcis (in Eubœa) according to FESTUS, for a kind of building. It is used but once by VITRUVIUS v. 1, who directs, if the site of a basilica be longer than three times its width, that chalcidica should be constructed at the ends, but leaves the use of such portions in extreme doubt; it has been concluded that the above directions refer only to the plan of the ground floor, and so contradict any suggestion that the chalcidicum might be situated on an upper floor. The only known example of an existing building in which a chalcidicum might be found is the basilica, as it is called, of Eumachia, at Pompeii, containing an inscription, which says that she built "chalcidicum cryptam porticus (porticum?), MAZOS, *Ruines*, fol., Paris, 1838, iii, 49; BECHI, *del Chalcidico e della Crypta*, Naples, 1820. CIAMPI has also written on this subject. It is considered that an inspection of the plan will show that the chalcidicum named must be the vestibule or portico opening to the forum. A supposition, however, that chalcidicum was not merely an important feature of some other building besides a basilica, but even a distinct edifice, is founded upon the following expressions in ancient inscriptions; viz., that Augustus at Ancyra built "curiam et (or ei) continens et chalcidicum templum-que Apollinis in palatio cum porticibus" (GRUTER, *Corp. Inscr.* fol., Amst., 1777, p. 232); that Bæbia Pasilla at Veleia gave a chalcidicum (sic in ANTONINI, *Ruine di Veleia*, fol., Milan, 1822, ii, 7); that the Memmii Rufi at Herculeaneum built "et chalcidicum et scholam" (CAPACCI, *Hist. Neap.*, 4to., Naples, 1771, ii, 94); and that L. Abuleius Dexter at Esernia built "macellum porticum et chalcidicum"; as well as the words "a chalcidico ad lucum" (MURATORI, *Thes. Inscr. Antiq.*, fol., Milan, 1739, 469, 480); CANINA, *Tempi Cristiani*, fol., Rome, 1846, p. 27.

But on the contrary, the chalcidicum of Eumachia might fairly be supposed to be an open loggia or saloon over the vestibule portico, which would reconcile the following uses of the word, viz., by AUSONIUS, *Periocha*, translating ὑπερώιον of HOMER, *Odyssey*, i and xxiii, as an upper chamber; by SALMASIUS upon SPARTIAN, p. 155, who states that it was a balcony, whether projecting or otherwise; in a glossary attributed to ISIDORUS, *Opera*, 4to., 1797, vii, 452, which says, s. v., "caldicum (sic); foris deambulatorium quod et petibulum (peribulum?) dicitur, et iterum (pterum?)"; and by ARNOBIUS, *Adversus gentes*, 4to., Leyden, 1651, iii, 105, 149, for an assembly or banquetting room. A. A.

**CHALCICÆCUS** (Gr. χαλκίκεος). The name given to a bronze shrine to Minerva at Sparta made by Gitiadas about B.C. 512; LIVY, *An.*, xxxv, 36; ÆMILIUS PROBUS; PAUSANIAS, iii, 17; Dio. CAS., li, 22, Aug.; and HYGINUS, *Fab.* 184.

**CHALEMBARAM**, see CHILLAMBARAM.

ARCH. PUB. SOC.

**CHALGRIN**, CHALGRAIN, or CHALLEGRIN (JEAN FRANÇOIS THERESE), *architecte du Roi*, born 1739, was a pupil of Servandoni, and in 1755 of Boullé, under whom he obtained in 1758 the *grand prix* of the Académie d'Architecture. On his return from Rome he was appointed *inspecteur* under Moreau, who was then *architecte de la ville*, and finished for the duc de la Vrillière the hotel in the rue S. Florentin or de l'Orangerie, designing the entrance, the court, and the internal arrangements. The patronage of the minister Bertin procured for him commissions for the continuation of the *collège-royal* in the place Cambray, several hotels in Paris and Versailles, country houses and gardens at this last place and at Chatou, as well as one of the *salles de bal et de festin* for the fêtes given 16 May, 1770, on the occasion of the marriage of the Dauphin. BLONDEL, *Cours*, 8vo., Paris, 1771, i, 110, ii, 273; and in that year he was received a member of the Academy of Architecture. The model of his design for the church of S. Sauveur in the rue S. Denis is preserved in the Ecole Polytechnique; and he is said to have succeeded Servandoni in the completion of the church of S. Germain des Prés. In 1777 he erected one of the towers, the chapelle des fonts and the buffet d'orgue, to Servandoni's church of S. Sulpice; built 1769-84 the church of S. Philippe du Roule, which is the subject of a large work; became architect to the comte de Provence (Louis XVIII), for whom he made several designs respecting the château de Brunoy and the palais du Luxembourg; this last building, under the republic, was used as a prison in which Chalgrin himself was confined, but was liberated in time to convert it into the palais du Directoire Exécutif, superseding the great staircase of Desbrosses by another which is considered one of the most magnificent of its kind. He became in 1797 member of the section of the Beaux Arts in the Institut; directed many of the public fêtes of 1796-7; restored the théâtre de l'Impératrice or Odéon, finished 1808; and commenced in 1809 the arc de l'Etoile, at first in conjunction with Raymond, but their disputes as to their respective columnar designs ended in the adoption of a third, *without columns*, which was carried out by Chalgrin, and continued by his pupil Goust. He died 20 January 1811. QUATREMÈRE DE QUINCY, *Eloge*, 4to., Paris, 1816; VIEL, *Notice Necrologique*, 8vo., Paris, 1814. 45.

**CHALK** (as a building material). A calcareous earth containing in a pure state 53 parts of lime, 42 of carbonic acid, 3 of water, and 2 of alumina. In some cases, as at Vernon, upon the banks of the Seine; at Caumont and S. Etienne, near Rouen; the middle chalk of the geologists becomes so indurated, and assumes so crystalline a character as to be fitted for all the architectural uses to which freestone is applied. In England this formation rarely attains this degree of hardness, though near Godstone and Rochester it is sometimes of a quality fit for use in small masonry, when precautions are taken to prevent its receiving water, either directly or by absorption. The French indurated chalk is susceptible of being raised in blocks of large size, but is disfigured by the great number of flints it contains; whereas the chalk used in England, being obtained from the lower division of the series, is usually free from those extraneous substances. The churches of Vernon, Louviers, les Andelys, and large portions of Rouen cathedral are executed in the stone obtained from the quarries of this material, and have resisted the action of the atmosphere in a tolerably satisfactory manner. The English chalk has not so resisted, unless employed internally, or in sheltered positions; its principal use, indeed, appears to have been confined to filling the spandrels of groined vaulting, for which purpose it is admirably adapted, on account of its low specific gravity when dry, and the ease with which it may be worked. In the west of England, as at Bishopstone, near Warminster, occasional beds of chalk as hard as that of Vernon occur, but not in sufficient quantity to repay the expense of working them. **BERE STONE.** In France a great deal of similar material is used, being protected from the weather by various cements, in which



case it answers tolerably well for building purposes. Chalk, used in the construction of cottages, barns, and stables, forms dwellings that are warm, impervious to damp, and lasting, in Southern Russia; *BUILDER Journal*, i, 568. FOUNDATIONS.

Chalk, as raised from the quarry, is usually considered to weigh about 145 lbs. per foot cube, and to have a specific gravity of 2.315. The French engineers, however, give the weight of the Vernon stone at 135 lbs. per foot cube, and its specific gravity 2.155; whilst they consider it to be able to resist a crushing weight equal to 3,122 lbs. per square inch, or nearly as much as Portland stone. BEARDMORE, *Tables*, etc., 2nd edit., gives the resistance of English chalk to a crushing weight at only 500 lbs. per square inch; but this must be the strength of only the softer material; for the resistance of the Bishop-stone chalk, near Warminster, would be equal to that obtained upon the banks of the Seine. RONDELET, *l'Art de Bâtir*; PASSY, *Géologie*; *BUILDER Journal*, vii, 279. G. R. B.

CHALK, see BLACK, WHITE, AND RED CHALK.

CHALK LIME. Any lime obtained by the calcination of the various beds of the cretaceous formations, or chalk, would, properly speaking, be called a *chalk lime*; but the custom of English builders appears to have restricted the application of the term to the limes obtained from the upper, middle, and lower chalks, and to have distinguished those obtained from the chalk marl by the specific name of STONE LIME, or sometimes by that of CLUNCH. The chalk lime of commerce is nearly a pure caustic lime; it absorbs water with remarkable rapidity; swells to a volume at all times greater than that it presented upon being taken from the kiln, but varying with the freshness of the lime and the mode of slacking; and unless mixed with some substances able to communicate to it the property of setting, masses of it would remain in the state of a soft paste for an indefinite period. For building walls, therefore, chalk lime of the purest description should never be used, unless with tarraas, pozzuolano, burnt clay, or a sand containing decomposed felspar. For rendering internal walls, or for use in positions where there is no moisture, and where the mortar is only applied in thin coats, chalk lime is usually employed, on account of its cheapness, and of its uniform nature. Under the most favourable circumstances, however, pure *chalk lime* mortar never attains the same degree of hardness as even imperfectly hydraulic *stone lime* mortar; while it is always soluble in fresh or salt water. The maximum resistance of the most carefully prepared chalk lime mortar never exceeds  $42\frac{1}{2}$  lbs. on the square inch. VICAT, *Traité*, etc., *des Mortiers*, etc., 8vo., Paris, 1856; CLAUDEL, *Formules*, etc., 8vo., Paris, 1854. G. R. B.

What is generally sold as stone lime in London is nothing but chalk burnt in what are called close or flare kilns, by the direct action of flame; it makes a very excellent lime, but is too hot and strong for plastering. For this purpose what is called chalk lime is used, which is burned in large kilns with much wider openings at top. The fuel employed is the coarse cinders or BREEZE of the brickmaker, thrown, together with the chalk, into the top of the kiln; the heat of course is slower and not so strong as that of the flare kiln. PASLEY, *Limes*, etc., 8vo., London, 1838, p. 13. A. A.

CHALON, or CHALONS-SUR-MARNE formerly written Scialon and Chaalon (the ancient Duro-Catalaunum). The capital of the department of the Marne, in France. Low walls, replacing the old ramparts, have six gates, of which the porte de la Ste. Croix deserves notice. The stone bridge, of three arches, was built 1787. The houses are chiefly old, of timber, and plastered. The large cathedral is dedicated to St. Etienne. A plan of the original edifice is given by VIOLETTE LE DUC, *Dict.*, s. v. *cathédrale*, 353, who considers it to be the unique link between the Rhemish and Rhenish schools of ecclesiastical architecture. BOURASSÉ, *Cathédrales*, 8vo., Tours, 1843, considers a tower next the north door in the style *Romano-Byzantin secondaire*; part of the nave and of the choir, *ogival primitif*; three chapels of the apse, *ogival secondaire*; the addi-

tional chapels, *ogival tertiaire*; a very rich chapel, *Renaissance*; and the great portal, modern (towards the end of the reign of Louis XIII). The aisle and chapels to the apse were added, and the nave almost rebuilt in the fourteenth century; the nave consists of ten bays, while the choir has only one; the western portion belongs to the last century; a fire in 1668 destroyed the vaulting of the apse, but the edifice was restored 1672. A north-west view is given in the *MOYEN AGE PITT.*, pl. 61. A drawing of the proposed restorations is given in the *BUILDER Journal*, v, 74. The building is illustrated by TAYLOR and NODIER, *Voyage Pitt.* (Champagne), fol., Paris, 1845; who also illustrate the interior of the church of S. Jean, and the early Romanesque church of Notre Dame de Vaulx; of this edifice the west façade and the interior, as far as the transept, were rebuilt in 1157; the eastern portion was completed in 1183. S. Remi at Rheims is supposed to be a copy of this church, by INKERSLEY, *Inquiry*, 8vo., London, 1850, who gives a long description of the peculiarities of this building, especially noticing the three-arched screen to each apsidal chapel, and the fluted columns, instead of buttresses, which were originally the supports of full-length statues. NODIER also gives the (*Renaissance*) old hôtel de ville. The other leading buildings of importance are two churches, the convenient episcopal palace, the nunnery, two hospitals, and six educational establishments; the hôtel de la préfecture 1764, distinguished for its simplicity, and considered one of the finest buildings of its kind in France; the hôtel de ville 1772; the barracks, formerly a Benedictine monastery; the riding school, and the theatre. The fine promenade called the Jard deserves notice. 28. 96.

CHALON or CHALONS SUR SAONE, formerly written Challon (the ancient Cubillonum). A city in the department of Saône sur Loire in France. A stone bridge of five arches connects the city with a suburb occupying the île de S. Louis or Laurent, in which is an excellent hospital, having some good glass, which like the building, is dated 1528. The antiquities consist of the remains of an amphitheatre and a granite column. The church of S. Vincent, formerly cathedral, is illustrated by MAILLARD DE CHAMURE, *Voy. Pitt. de Bourgogne*, fol., Paris, ii, 33, who states that it was rebuilt 1386, and consecrated 1403, that plans were made 1777 for its embellishment, that Chenavart erected the two new towers, and that the repairs were suspended 1830. The triapsal *chevet* is dated 1180-1223 by RAMÉE, *Histoire*, 8vo., Paris, 1843, ii, 173, and an interior view is given in the *MOYEN AGE MONUMENTALE*, 350. The church of S. Pierre, the hôtel de ville, the palais de justice, the public library, the high school, the small theatre, the baths, and an obelisk to commemorate the opening of the *Canal du Centre*, are the principal public works. AGRICOLA. 28. 96.

CHAMEROPS PALMETO, the Cabbage tree. A palm of Florida in the United States of America. The name of cabbage tree is also given to the palm ARECA.

The trunk grows of a uniform diameter to a height of from 40 to 50 ft. The wood in the Southern States, though extremely porous, is preferred to every other for wharves, not being attacked by sea worms, but if exposed to be alternately dry and wet it speedily decays. The tree was formerly employed in constructing forts, as the wood closes without splitting on the passage of a ball. MICHAUX, *Sylvia*, 8vo., Phil., 1819.

CHAMAS (SAINT). (The Latin Sanctus Amantius.) A town in the department of the Bouches du Rhone in France. It is celebrated for a Roman stone bridge, now called pont Flavien and pont Surian, of one arch 41 ft. in span, and 83 ft. long between the exterior faces of an archway of the Corinthian order at each end; LABORDE, *Monumens*, fol., Paris, 1816. A tunnel 213 ft. long through a hill connects the old and new portions of the town. 28. 50.

CHAMBER. (It. camera; Sp. camara; Fr. chambre; Ger. kammer.) This word, derived from the Greek *καμάρα* and the Latin *camera*, both meaning a vault, has been adopted from the French to express at the present time (with the exception of the Presence chamber and the ANTECHAMBER in a royal

palace) a bed chamber; APARTMENT; and by a natural extension it is used for the excavated or constructed hypogeum in which a corpse is deposited. The word however has had a more extensive meaning; it was used for a bedchamber, Fr. *chambre à coucher*, defined as either *en estrade*, *en alcove*, or *en niche*; *Illustrations*, pl. 118; for a state room, generally a bed-chamber, Fr. *chambre de parade*; and for a room in which the sovereign held a *lit de justice*; from which the word was applied to one in which a feudal lord held his court of justice, called in France *chambre du dais*, *chambre de parlement*, and hence *chambre des Pairs*, *des Députés*, etc.: in the same language *chambre en galetas* means simply a barrack room in a roof for servants. The defence and decoration of a state chamber in the middle ages is described at length by VIOLETTÉ LE DUC, *Dict.*, s. v. The 'great', the 'little', the 'king's', the 'queen's', and the 'priest's' chamber are usually named in English records.

CHAMBERS. This word, employed at least as early as 1551 in the singular, for the technical appellation of the room appropriated to any members in the Inns of Court, appears to have been first used in the plural about the middle of the eighteenth century; yet 'chambers' seems to have been first commonly adopted, when the Albany in London was established in 1804, for a suite of apartments for one occupant: 'rooms' is the term still employed at the universities. Lately the practice of employing such a suite for business purposes has again altered the meaning of the word chambers to that of a building divided into offices only. In the Inns of Court in London each suite of chambers is a freehold, and is separately assessed for rates and taxes.

CHAMBERS, or CHAMBRÉ (DR. JOHN). Physician to king Henry VIII, was last dean of St. Stephen's chapel in the palace at Westminster, succeeded Forster in 1526, and built the cloisters (which exist 1856) of "curious workmanship, to the charges of 11,000 marks." Srow, *Survey*, fol., London, 1720, vi, 54.

CHAMBERS (SIR WILLIAM), R.A., F.R.S., F.A.S., F.S.S.S., was born at Stockholm about 1726, his father having quitted Yorkshire for Sweden; at two years old he was sent to England, and returning to Sweden he became supercargo in the service of the Swedish East India Company, when he visited China; but abandoning commercial pursuits at eighteen years of age, he travelled into France and Italy (studied under Clerisseau at Paris), and resided some years at Rome, where his drawings attracted much attention. Returning about 1755 to England, he settled in London, and through the intervention of Joshua Kirby and John Gwynn he became the instructor of the prince of Wales in architecture: EDWARDS, *Anecdotes*, etc., however, states that Chambers introduced Kirby. The introduction of Chambers has hitherto been erroneously ascribed to Carr of York.

About this period he published *Designs of Chinese Buildings, Furniture, Dresses*, etc., fol., London, 1757, from notes and measurements made during his sojourn at Canton. He erected at Coleby hall in Nottinghamshire, the seat of Charles Mainwaring, esq., a temple (modeled on that of Romulus and Remus at Rome), said to be his first building in England; and before 1767 the villa (Parksted) at Roehampton in Surrey, for the earl of Besborough, this was his first work of much magnitude, and was satisfactorily erected by him under contract; WOOLFE and GANDON, *Vit. Brit.*, i, 11-13. About 1759 the theatre and chapel of Trinity College, Dublin, were carried out from his designs by Mr. Meyers, architect; and he also furnished plans for the improvements about that period of the college, including the building, with its archway and bell tower, dividing the two courts. The Royal Exchange in that city has been erroneously attributed to him. In 1759 he published *A Treatise on Civil Architecture*, fol., London. At the end are plates of the casino 'now erecting' at Marino near Dublin, for the earl of Charlemont; a triumphal arch and a casino at Wilton near Salisbury, for the earl of Pembroke; a casino at Tanfield hall, Yorkshire, for lord Bruce, afterwards earl of Aylesbury, 'to be erected'; with designs for a monopteral temple at Birdshall

in Yorkshire, for Henry Willoughby, esq., afterwards lord Middleton; a Doric octagon temple, designed while at Florence, for the earl of Tylney, 'proposed to be erected' at Wanstead; a Corinthian prostyle temple for Kew; a house for Sir Thomas Kennedy (afterwards earl of Cassilis), of Cullean in Scotland; a cenotaph to the memory of Pope, Gay, and Swift, for Kew; entrance gate for the earl of Richmond at Whitehall, London; with other gateways and temples. A second edition of this work was published by him in 1768, and a third in 1791, 'considerably augmented', when, as he had not prepared the constructive portion, as at first proposed, he altered the title to *Treatise on the Decorative Part of Civil Architecture*. In this edition he added three plates of ornamental subjects.

During the years 1757-62 he was employed to lay out and improve the royal domain at Kew near London; the designs were published, as *Plans, Elevations, Sections, and Perspective Views of the Gardens and Buildings at Kew in Surrey*, fol., London, 1763, and exhibit buildings in the Chinese and Italian styles of architecture. Previously to 1767 he had erected Dudington near Edinburgh, for the marquess of Abercorn, at a cost of £30,000, WOOLFE and GANDON, *Vit. Brit.*, i, 14-17; and a bridge at Hoo in Hertfordshire, for Thomas Brand, esq., i, pl. 18.

About 1768 he erected in Richmond Park, for the king, an observatory (now used by the British Association for the Advancement of Science); before 1771 Castle Hill, Dorsetshire, the seat of Fitz Foy, esq., WOOLFE, ii, 61-63; 1771, designed the monument in the chapel of St. John the Evangelist in Westminster abbey, in memory of the earl and countess of Monrath; made a series of drawings of the works at Kew, which he presented to the king of Sweden, who created him a chevalier of the order of the Polar Star; and was allowed by king George III to assume the style and title of knighthood: in 1772 he published *A Dissertation on Oriental Gardening*, 4to., London, of which a second edition appeared in 1773; and about this period designed, in the Pointed style to accord with the abbey church, Milton Abbas in Dorsetshire, for Joseph Damer, lord Milton, afterwards earl Dorchester; the old abbot's hall still exists; NEALE, *Seats*, iv, ser. 2.

In 1774 he visited Paris for the second time; in 1775 designed, and in 1776 commenced on the site of old Somerset house and gardens, the erection of the noble and extensive mass of public buildings known as Somerset Place, of which plans and a full description are given in PUGIN and BRITTON, *Edifices of London*, 8vo., London, 1828.

Amongst his other works are the stabling at Harewood in Yorkshire, for Edwin Lascelles, esq., afterwards lord Harewood, for whom he made, soon after his return from Rome, a design for an extensive house, not executed; a mansion for lord Melbourne (before 1770), now forming the centre house in the Piccadilly entrance of the Albany; another for lord Gower, in Whitehall (since occupied by lord Carrington); a villa for Sir Joshua Reynolds, at Richmond-hill; St. Mark's or the German Lutheran chapel, in the Savoy, London; the market house at Woodstock in Oxfordshire; a mansion, Queen's-walk, Green Park, for Mr. Errington; a house for himself No. 13 Berners-street, Oxford-street, after 1759; additions in the style of Vanbrugh to Blenheim palace in Oxfordshire, including a bridge, a Tuscan gate forming the principal entrance to the kitchen garden, given in pl. 47 of his *Treatise*, a tripod, in pl. 51, with the state bedstead; a bridge in the park at Woburn, for the duke of Bedford; and 1789 continued the erection of Cold Bath Fields prison, London. He was largely employed in designing furniture and decorations. As designs only, may be mentioned a model of a palace for king George III, now at Hampton Court; about 1771 a church for the parish of St. Marylebone, London; Ashridge, co. Bucks, for earl Bridgewater; about 1771 Claremont near Esher, for lord Clive; Blackfriars bridge; a palace for the dowager queen of Sweden; and a mausoleum for Frederick prince of Wales, dated 1751.



some of which are comprised in the collection of drawings and designs by Chambers, in Sir John Soane's museum; where is also a bust in marble by Sir (then Mr.) R. Westmacott. A medal to his honour has been struck by the Art Union of London.

At the death of Flitcroft, in 1769, he was appointed comptroller-general of the Board of Works, and succeeded Whitshed Keene as surveyor-general of the Office of Works, on its constitution 10 October 1782: he was also an original member of the 'Architects' Club', founded 1791, which no longer exists. A portrait of him by Sir Joshua Reynolds is in the collection of the Royal Academy of London. His chief pupils were James Gandon, Edward Stevens, John Yenn, and Thomas Hardwick: Willey Reveley, the late John B. Papworth, and others, were likewise indebted to him for instruction in architecture. He died 8 March 1796, and was buried in Westminster abbey. Sir William was architect to the prince of Wales (afterwards king George III) and the princess dowager of Wales; treasurer of the Royal Academy of Arts in London (at the formation of which in 1768 he greatly assisted); and member of the Academies of Fine Arts in Florence, and of Architecture in Paris.

CHALMERS, *Biog. Dict.*; GENTLEMAN'S and EUROPEAN MAGAZINES for 1796; MULVANY, *Life of Gandon*, 8vo., Dublin, 1846; and GWILT and PAPWORTH, in their editions of the *Treatise*, 1825 and 1826.

CHAMBERY, or CIAMBERI. The capital of Savoy, in the Sardinian States. It consists of well built houses, and modern public edifices, chiefly three stories in height, in narrow and crooked streets. The cathedral, dedicated to S. Francis de Sales, finished 1430; three churches, three nunneries, two monasteries, a college of the Jesuits, a citadel or castle (thirteenth century) including a pretty church, 1415, restored in 1803, five hospitals, three large educational establishments, a theatre, public baths, large barracks erected by the French, and a cemetery, are the chief objects of interest. 50. 96.

CHAMBICHES, CHAMBIGES, or CAMBIGES (MARTIN), of Cambrai, is mentioned by the COMITÉ HISTORIQUE, *Bulletin*, 8vo., Paris, 1843, i, 274, as having been employed to construct the *portail* of the cathedral at Troyes. With Jean Vast, he directed the erection of the transepts to the cathedral at Beauvais, commenced 21 May, 1500; their joint report, dated 2 July, 1512, is still preserved in the *registre des dépenses*, as noticed by WOILLEZ, *Description*, fol., Paris, 1838, pp. 5-6, who mentions the salary given, and the assistance granted in 1528 to Chambiges (his own signature), who died 29 August 1532, was succeeded by M. Lalye, and was buried in the nave.

This was not CAMBICHE, or CAMBRICHE, of Paris, according to LOUVET, *Hist. de dioc. de Beauvais*. Chambiche built the lower story of the *petite galerie* of the Louvre for Charles IX to use the roof as a terrace for a promenade: the upper story was added under Henri IV by Fournier and Plain. Cambiche was master of the masons at the hôtel de ville at Paris in 1533-49; SAUVAL, *Histoire*, fol., Paris, 1724, ii, 37, 483.

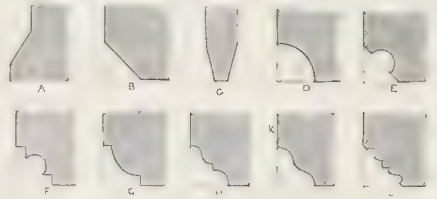
CHAMBLIN, see BULLE (JEAN BAPTISTE).

CHAMBORD. A village, situated twelve miles from Blois, in the department of the Loire and Cher in France. It is famous for the château, now generally allowed to be the design of an architect resident at Blois, whose name is not known. The building was commenced 1526, and was not only continued without much intermission until 1571, but received under Louis XIII the additions of the stables masking the *cour d'honneur*, and under the two following monarchs the low screen at the back, designed by Mansard. The kitchens, etc., are in ruins. The grand central staircase, à double vis, is the great object of attraction; local tradition states that the four towers, 60 ft. in diameter, attached to it on a cruciform plan, were not originally divided into floors; but these additions are of not much later date, and their details accord well with the earlier work. The chapel is handsome and well preserved, and the twelve staircases and four hundred and forty-four chambers are less curious for their number than for the variety of design and

effect. DE LA SAUSSAYE, *Chambord*, 4to., Blois, 1837, gives a bird's-eye view of the edifice, and a good view of the cupola of the staircase at the top of the roof. LE ROUGE, *Chambord*, fol., Paris, 1749-51; MERLE and PÉRIÉ, *Description*, fol., Paris, 1821 and 1832; GILBERT, *Notice Historique et Descriptive du Château de Chambord*, 8vo., Blois, 1832; BLANCHETON, *Vues Pittoresques*, fol., Paris, 1830; VERGNAUD-ROMAGNÉSI, *Notice sur le Château*, etc., 8vo., Paris, 1832; CHAPUT, *France Monumentale*; GAILHABAUD, *Monumens*, s. v., iv; Paper read at the Royal Institute of British Architects by CRACE, given in the *Builder Journal* for June 12, 1847; *Illustrations*, Chimney, pl. 44.

CHAMBRANLE. The name adopted from the French by old English writers, for the dressing to an opening, as a doorway, fireplace, or window. ARCHITRAVE. In the last case the sill sometimes, being decorated similarly, forms a fourth side of the dressing: the French term is *chambrante à cru* when there is no such ornamental sill, and *chambrante à croisettes* when the dressing has shoulders. The old term for the 'head and sides' of the chambranle were the 'traverse and ascendants'. DOOR CASE. WINDOW FRAME. 1. 2.

CHAMFER or CHAMPFER (in old English, *campher*, *cypher*, *skew*; Indian, *chaihee*; It. *smusso*; Sp. *alfeiza*, *alheiza*; Fr. *chanfrein*; Ger. *auskehrung*). The surface formed by taking off diagonally the arris between two faces of a squared piece of wood, stone, brick, or metal, so that two new arrises are formed. The mediæval workmen avoided as much as possible the right-angled arris whenever there was a probability of its being injured, especially in the lower parts of buildings, as in doorways, buttresses, etc.; and the most frequent, as well as economical, substitute was the plain chamfer. It may be said that one half of the groups of moldings of the Pointed styles owes its primary existence to the chamfer, which frequently leaves vestiges of its existence, although its face and return, as K, may have been molded. In mediæval architec-



ture for upright and arched work the chamfer was generally cut at an angle of forty-five degrees, B, except where an appearance of lightness was desired, as in formerets, liernes, etc., C: in horizontal work, as A, the chamfer, forming a WATER TABLE, was generally increased in height as its position was raised from the ground. The form shown at D, more or less hollow, has been called a chamferet, and a hollow chamfer. BEVEL. BOARDING.

The termination of a chamfer is called a STINT or CHAMFER STOP. In the First and Second Pointed styles, but more especially in the former, it is an ornament, in many cases characteristic of its date: examples are given in the GLOSSARY, 8vo., London, 1850, pl. 135; *Builder Journal*, iii, 551; BRANDON, *Analysis*, 4to., London, 1847; HOFFSTADT, *Principes*, fol., Frankfurt, 1847, pl. 2 and 7; and KITTOE, *Illustrations*, fol., Calcutta, 1838, pl. 41, gives a series of thirty-six remarkable ones, called *chaihees*, used in Hindostan.

CHAMFERED STOP or STINT (Fr. *biseau*). A term applied to a chamfer forming a stop to a chamfer, angle bead, or other similarly situated molding.

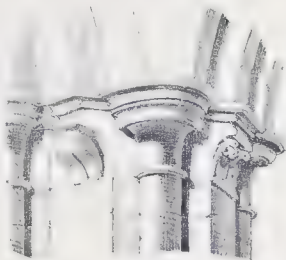
CHAMFERET or CHAMFRET. A term which has been used for a hollow channel or gutter, called in French *chanfrein creux*, and is now translated 'a hollow chamfer'. 16.

CHAMOIS (. . . .) erected at Paris about 1680 the hôtel (one of the largest in the city at that time, and given in BLONDEL, *Arch. Fran.*, fol., Paris, 1752, iii, 83), in the rue de Riche-

CHAMFER STOI



HENKRAMPOTEAL



8<sup>th</sup> Trancept, NETLEY ABBEY



Church, ST. PETER'S, Kent  
T. B. Horne



S ALBANS C. F. Cresswell



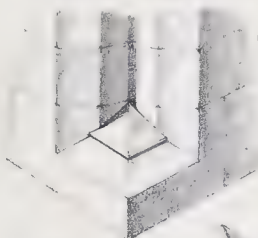
NUREMBURG, C. F. Cresswell, M. I. R. A.



HEDON, Yorkshire



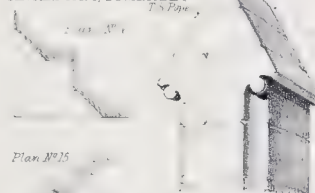
SOUTHAMPTON



Clevedon Court, SOMERSET



Base of Cross LL. ANWENARTH



HIGHAM FERRERS, Northamptonshire



Cathedral, GLOUCESTER



S. Giovanni, SYRACUSE



NUREMBURG



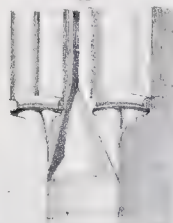
S. Giovanni, SYRACUSE



HINTON (Gloucester)



BOYTON, W. I. R. A.







lieu, for François Michel le Tellier, marquis de Louvois; the convent of the Filles de la Visitation, about 1673, at the corner of the rues de Grenelle and du Bacq in the faubourg S. Germain; the Benedictine nunnery in the ville l'Evêque in the quartier du Palais Royal; and the convent of the Nouvelles Catholiques in the rue Ste. Anne, near the Carrefour Gaillon in the faubourg S. Honoré; as well as the château of Chaville, near Paris, for the marquis de Louvois, which was purchased together with Meudon by Louis XIV. BRICE, *Description de Paris*, 12mo., Paris, 1725, i, 351.

5. 74.

CHAMP or CHAMPE. The old term for a flat surface wider than a mere fillet; also for the ground of work executed in rilievo. ABATED.

16. 17. 19.

CHAMP-ASHLAR—champre—chamfered, is explained by DAL-  
LAWAY, *Discourses*, 175, as work grooved or hollowed out.

CHAMP. A valuable kind of East Indian timber produced by the MAGNOLIA excelsa: it is also described as a good soft timber, the produce of a palm-tree growing in the woods of Nepal.

14. 71.

CHANCEL. This word, derived through the late Latin word *cancellum* from CANCELLUS, a grating, is at least as old as 1400. CHAUCER (*Miller's Tale*), spells it "chaunsell", and expressly mentions it as the place where the friars sang the "lauds", the second in order of the breviary services. The expression "chancel or quier" occurs, under the date 1561, in the ARCHÆOLOGIA, xi, 76. The term chancel was evidently applied in these instances to the eastern portion of a conventual and of a collegiate church; it is now used (in England only) to denote the eastern portion of a church, cruciform in plan and of less rank (as a parochial church), as well as to denote the building which was attached (in place of the APSE in a BASILICAN CHURCH) at the east end of the nave to parish churches built about the year 1200 and afterward. Throughout Italy this abscidal part, generally called the TRIBUNE, is identical with the *βήμα* of the ancient Christians, and quite distinct in its meaning from "CHOIR". In England the choir seems almost universally to have assembled at the eastern part of the church to recite the breviary services; while abroad the choir was and is moved from place to place according to convenience, and the laity were and still are excluded from the place during their celebration by gratings and gates of wood or metal, and very frequently also by curtains. In Italy to this day these screens are called *cancelli*; and in France (VIOLETT LE DUC, *Dict. s. v.*) *chancel* signifies an enclosure, SCREEN, or balustrade. VIRLOYS, *Dict.*, 1770, explained the Italian *cancelli* and French *cancel* as the part of the choir of a church which is between the altar and balustrade enclosing the altar: he adds, "ancien terme qui signifie ce que nous appellons aujourd'hui sanctuaire". Previously to the Reformation this eastern portion or chancel was provided with an altar, a piscina, an aumbry with its shelf on the east wall or north side, sedilia on the south side; a small side entrance or priest's door also on the south side, and sometimes also on the north; and two or even three rows of stalls or open seats on each side. CHANCEL BENCH.

The English mediæval chancel is very seldom less than one-third the length of the nave, and often of equal length. In almost all cases one step at least is ascended at the chancel arch, and two, three, or more, near the altar itself. Where there are crypts or, as abroad, *confessioni*, of course more steps are necessary; nine steps have been used accompanied by a crypt, as in the church of the Holy Trinity at Bosham in Sussex, or by a right of way under the chancel, as at S. Stephen and at S. John in Exeter. There are many examples in England where the chancel and nave are both on a level, and a very few where the chancel floor is lower than that of the nave, as at St. Giles's in Cambridge; but it is generally found in these cases that the nave has been rebuilt, or at any rate is of much later date than the chancel. In the south of England the solid oak cill of the rood screen frequently forms the steps. The chancel is generally narrower than the nave; but, in some

cases, of the same width as in the churches at Chayley and Southease in Sussex; and in almost all instances the walls are lower, so that though the roof be of the same pitch, the ridge of the chancel is below that of the nave; but the division at Wymington in Bedfordshire, is not visible externally; in a cross church it is sufficiently marked by the transepts.

In early churches, as shown under BASILICAN CHURCH, the tribune or *βήμα* was usually an absidal termination. In later times, when the eastern end had aisles as well as the nave, chapels were formed on each side of the high altar, one containing the altar of the Virgin, the other of the Blessed Sacrament. CHANCEL AILE. These also were frequently absidal. There are neither choirs nor chancels to the churches built by the Jesuits.

The views held by the Ecclesiological formerly the Cambridge Camden Society, will be found in the publications issued with the sanction of either name. Its *Handbook*, 12mo., London, 1847, p. 41, gives a list of chancels with absidal ends, and pp. 198-9, many notes upon the existence of confessional windows in the walls of chancels, and of confessional chambers within chancels.

At the time of the Reformation the framers of the Book of Common Prayer seem to have considered the building as composed of "church, chapel, or chancel", as in the first Rubric, in which also it is ordered that "chancels shall remain as they have done in times past." In the fourth Rubric to "the Order for the Administration of the Lord's Supper", it is ordered that "the table shall stand in the body of the church, or in the chancel, etc."; and as the Reformers seem to have adhered to the practice of the Church from the earliest times to those at least of S. Augustin, A.D. 590 (ALTAR), of having one table only in a church, it may explain the reason why these tables were always to be moveable (see the decisions in the cases of S. Sepulchre's, Cambridge, and of S. Paul's, Knightsbridge).

AYLIFFE, *Parergon*, fol., London, 1734, pp. 136, 455-59, considers the question of the repair of a chancel as thrown upon the rector or parson (who has the right of refusing sepulture in the chancel), except where this charge is transferred to the parishioners by custom, as in the city of London; his distinction between a church or nave, and a chancel, should be compared with the expression "church, chapel, or chancel", in GIBSON, *Cod.*, fol., Oxford, 1761, p. 297; who, p. 200, mentions the right of the ordinary to dispose the seats in the chancel, a license for the erection of seats therein, and the decision in the court of Queen's Bench, 7 James I, that the rector impropriate is entitled as such to the chief seat in the chancel, but that another parishioner may have it by prescription.

It has been laid down that no layman ought to go into the chancel; and this is chiefly on authorities that the laity should not enter the choir: about one-third of the church is thus practically useless, and inconvenient for those parts of the service read from the communion table. Besides this, it prevents the daily morning and evening prayers being read in the chancel, which would be quite large enough for the usual attendants on those occasions. The article CHOIR must be referred to for explanation. LADY CHAPEL. SACRAMENT CHAPEL.

A. A.

CHANCEL AILE. Although in the cathedrals there were regular aisles with piers and arches to the eastern portion of a church, even in the Norman period, it was not till later times that the chancels of small churches generally had aisles. When there was an aisle to the chancel, the division between that and the nave aisle was clearly defined by an arch. The two aisles often had a separate roof, and sometimes, as at All Saints, Witley, Surrey, they were divided by a wall. But the separation between the two became less and less; and towards the middle of the fourteenth century the aisles generally ran one bay to the east of the chancel arch. In some tracts of country, as for example about Faversham and Maidstone, this arrangement is all but universal. Gradually the aisles were lengthened to the very eastern end, though sometimes the chancel projected a half bay beyond them. The arrangement of the



parcloses in these late chancel ailes is of two kinds. Sometimes they are found at the west ends, shutting them off like inferior chancels; sometimes between these ailes and the chancel, throwing them into the nave: CAMBRIDGE CAMDEN SOCIETY, *Handbook of English Ecclesiology*, 12mo., London, 1847, p. 114. Mention is made, in describing some churches, of a *chancel* of a particular family: this use of the word appears to have arisen where a family had a private oratory, which has also been usually a burial place, within a church: and then, as this *chapel* has been separated from the rest of the church by *cancelli* of some sort, the chapel is called a chancel for the same reason that the "great choir" is also sometimes so called. "This (Fairford) church, built about 1500, has, like Thornbury, and others of evident erection within the century preceding the Reformation, three chancels or continuations of the ailes: the middle was always for the officiating priest, and one at least of the others preceded pews, as an accommodation for the lord of the manor." FOSBROKE, *Hist. of Gloucester*, 4to., Gloucester, 1807, ii, 461. There was usually an altar at the eastern end of the ailes.

CHANCEL ARCH. An arch formed in the east wall of the nave of a church, carrying the gable above and separating it from the chancel. By the sides, or in the piers, if there are double ailes, are generally found the small staircases leading to the rood loft: as also the perforations usually called HAGIOSCORES. Some few instances occur of small windows in the gables over the chancel arches. Wells cathedral; S. Mary Finedon in Northamptonshire; Barton in Cumberland; All Saints at Brailsford in Derbyshire; S. Mary's at Barfreston in Kent; Baulking in Berkshire; Runton in Norfolk; S. Mary's at Capel le Ferne, and Westwell, both in Kent; St. Mary's at Bramford in Suffolk; S. John's at Baginton in Warwickshire; Little Shelford in Cambridgeshire; and S. Michael at Melbourne in Derbyshire, offer remarkable deviations from the general type of a simple arch.

CHANCEL BENCHES. These, of stone, are observable externally on the south side of S. Swithin at Ganerew in Herefordshire; S. John's at Glastonbury; and S. Margaret's at Spaxton; on the east side at Bicknoller, both in Somersetshire: internally along one or both walls in SS. Mary and Michael at Trumpington in Cambridgeshire, and along the east end also in S. Medard's at Little Bytham in Lincolnshire: CAMBRIDGE CAMDEN SOCIETY, *Handbook*, 12mo., London, 1847, p. 69. SEDILIA; STALL.

CHANCEL SCREEN, see ROOD-LOFT; SCREEN.

CHANCERY. This word is derived from CANCELLUS, through *cancellaria*, of which DUCANGE, *Gloss. s. v.*, says: "Ita vero dicta quod in capella Principis, seu oratorio archivum, diplomata et regni monumenta olim, ut hodie, asservantur. In Francia enim chartarum regiarum, ut vocant, thesaurus, in Sacra Capella Parisiensis etiamnum asservatur": (It. *cancellaria*; Sp. *cancelaria*, *cancelleria*, *cancilleria*, *chancilleria*; Fr. *chancellerie*; Ger. *kanzlei*). The building or portion of a building appropriated to a chancellor for the performance of his duties personally or by deputy. Embassies and consulates generally have a chancellor, whose offices are more commonly called by the French name than by the English one. Upon the continent almost every officer bearing the title of chancellor is provided in a public building with suitable rooms for the transaction of business, as vestibules, halls, waiting rooms, audience and council chambers, offices for clerks, public and private reception rooms, etc., according to his rank, to which apartments an official residence is frequently attached. The *chancellerie de France* in the rue de Luxembourg, with the residence, 13, place Vendôme at Paris, has been considered a model: the *palazzo della cancellaria* at Rome is one of the most admired works of Bramante. The doorway of the south tower of the cathedral at Canterbury is said by EADMER, about 1100 A.D., to have been used as the highest court of the king; i.e., a chancellor's court or chancery.

CHANDANAVATI in Guzerat, see BARODA.

CHANDELIER. This word is defined by the ACADEMIE FRANÇAISE *Dict.* as a support for one or more lights. It is remarkable that GUENEBAULT, *Dict.*, states that a *candelabrum* is often suspended, while a *chandelier* always stands on the floor; an explanation which is exactly the reverse of the English and Italian uses of these words. CORONA LUCIS.

CHANDISEWU, in Java; see BRAMBANA.

CHANDODE, a town of Guzerat in Hindostan. "No place in the western provinces of Hindostan is reputed so holy as Chandode; none at least can exceed it: its temples and seminaries almost vie with the fanes of Juggernaut and colleges of Benares. The principal temple is furnished in a style of taste and elegance superior to any in that part of India; the central spire is light and in good proportion; the interior of the dome is 40 ft. diameter; the concave painted by artists from Allahabad in distemper, which is very durable in that climate. The temples abound with exterior sculpture." FORBES, *Oriental Memoirs*, 4to, London, 1813, iii, 6-16.

CHANDRABAGHA or CHANDRAVATI, in Northern Malwar, see JHALRAPATUN. This city is frequently confounded with

CHANDRAVATI, CHANDRAVARTI, or CHANDRAWUTTEE, pronounced Chandrâti, "the city of the Moon"; also called CHUNDAÏL. A town, once fortified, near Mount Aboo, and about sixty miles west of Oodipore in India. Ton, *Annals*, 4to., London, 1829, i, 798. The same author, *Travels*, 4to., London, 1839, pp. 127-134, states that twenty edifices built of white marble existed there in 1824, and gives three illustrations.

CHANIVALLE (MARCO ANTONIO), see CANIVALLE.

CHANNEL, see BEAK; CANALIS; CANAL OF A CORONA; and KENNEL.

CHANNEY MARROM and CHANNEY VENGAR, are native names of woods of Travancore. The former is of a brown, and the latter of a light yellow colour; both are used for building houses. The latter grows to 6 ft. in circumference. 71.

CHANTLATE. A French word adopted, according to NEVE, *Dict.*, 8vo., London, 1736, for "a piece of wood fastened near the ends of the rafters, and hanging over the wall, to support two or three rows of tiles, to keep the rainwater from running down the sides of the wall." EAVES BOARD.

CHANTRY or CHAUNTRY (in late Latin *cantaria*; Ital. *cantoria*; Fr. *chanterrie*; Ger. *cantorei*). This word properly means an endowment for the perpetual provision of ecclesiastics to chant masses and offer prayers for the founder and for those whom he might name. The erection of monasteries and churches, *pro salute animæ*, appears to have become less frequent on the part of private persons about the middle of the twelfth century, when it became a custom to endow chantries at particular altars. A list of so-called chantry-altars remaining in England, given by the CAMBRIDGE CAMDEN SOCIETY, *Handbook of English Ecclesiology*, 12mo., London, 1847, p. 44, shows that at Gloucester there were several altars (perhaps for oratories) in the triforium of the cathedral, the cill of the windows forming the mensa or table.

A screen of open tracery separated the small space at the altar of the chantry from the rest of a church. In small churches the chantry was either at the east end of the ailes, as testified by the piscina frequently, as well as an ambrey sometimes, found there, or it formed one aisle to the chancel; in the last case there often occurs between the chancel and the chantry an arched recess or place for a monument in the wall, and such recesses are most probably the tombs of the founders of the chantry, though called the founder's tomb with a vague reference to the church: "where sedilia occur, in chantry chapels, which is not very often, they are generally met with in a southern chapel, perhaps simply from the difficulty of position in the other case", according to the *Handbook*, p. 57, which, pp. 198, 199, mentions the case of apertures for confessionals in the walls of chantries, an external door permitted the priest to have access

at all times. In cross churches the transepts were frequently devoted to the purpose of these foundations, which otherwise were added to their east sides. It occasionally appears that at the time of the erection of a large church, each separate external bay was so constructed as to become a chantry chapel, either by the builders in anticipation of an endowment, or by an individual who took advantage of the occasion to obtain a chantry chapel, on redeeming the foundation of a revenue for the ecclesiastics by his payment for the building. The walls of chantries established for fraternities or guilds, as frequently occurred on the continent, are usually decorated with pictures and a rich altar piece: the chantries of families have been more or less filled with monuments, and some in England still contain the memorials of many generations. The chapels of Henry V and VII at Westminster, chantry chapels on a royal scale, with the bishops, at most of the English cathedrals, were actually external additions to the original building; while such as those of Beaufort, Edington, Fox, Gardiner, Waynflete and Wykeham, in Winchester cathedral (if they are all chantries), are rather miniature constructions and independent. Chantry chapels were built at times on the way side. Some few examples remain in England of such structures forming an important appendage to a bridge, as at Wakefield and Rotherham in Yorkshire.

**CHANTRY CHAMBER, COLLEGE, or HOUSE.** The room or rooms appropriated to the use of the priest or priests, who were attached to a chantry chapel. These establishments were broken up when property given for the support of churches was confiscated, 1 Edward VI. BLAKEWAY and OWEN, *History of Shrewsbury*, 4to., London, 1825, ii, 117, mention the instrument dated 4 July, 1333, by which S. Mary's monastery granted at its own charge a daily chantry at their altar of S. Winifred by a secular priest, who was to receive a chamber fitting his estate in the almshouse and six marks yearly. Over a chantry chapel on the north side of Warmington church in Warwickshire, was a chamber with a fireplace in the west side, a closet in the north-west angle, and a window in the south wall. There is a similar one at Chipping Norton in Oxfordshire: in the west wall of this chapel is a flight of stone steps, leading to the chamber above, through apertures in the walls of which both the chancel and the north aisle of the church could be watched. Other churches contain chambers apparently for the accommodation of a chantry priest, and the *parvise* or room over the porch was probably often used for a like purpose, as well as for the sacristan. BLOXAM, *on Chantry Altars in the Trans. of the CAMBRIDGE CAMDEN SOCIETY*, 4to., Cambridge, 1841, p. 9.

**CHAORI, séngār cháórti**, or nuptial hall. A term used in Hindostan. "This is not the literal interpretation, but the purpose for which it is applied. Cháórti is the term always appropriated to the place of nuptials; séngār means ornament" according to TOD, *Annals*, 4to., London, 1832, ii, 709, who adds, "it is a square (cháórti) of forty feet," etc. He also, p. 285, translates chaori, a ring, which probably should be choori, p. 298. FERGUSSON, *Rock-cut Temples*, 8vo., London, 1845, p. 54, in a passage which suggests that any Brahminical porch, larger than its attached temple, was generally called a chaórti, further draws a parallel between excavated and structural works belonging to the class of mantapas, i. e., porches. The same writer, however, *Picturesque Illustrations*, folio, London, 1847, p. 16, speaking of almost all such temples of the Vaishnavas and Sivites in the north of India, observes that "the VIMANA, with its MANTAPA and intervening ANTARALA, form the temple, properly speaking; but they seldom stand alone without some additional buildings, one of the most common and indispensable of which is a maha mantapa—a great porch, shown in the plan of Barolli—whereas generally in upper India it is called a chaórti or nuptial hall, and seems to have been used for marriages, or indeed any religious ceremony performed in public, for which the temple itself is mani-

festly unfitted. Into it also the gods were, at certain seasons, brought out and exposed to public view:" and this author enters into a long detail of the systems adopted in planning and roofing these great porticos: at pp 31, 35, 36, he gives instances of such buildings at Barolli; and near the Mokund-durra Pass, which is also described by TOD, p. 739, who mentions, p. 717, another at Ganga Bhéva near Barolli.

**CHAPANEER** in Guzerat, see PAVANGHUDD.

**CHAPEL** (It. *cappella*; Sp. *capilla*; Fr. *chapelle*; Ger. *kapelle*), derived through the late Latin word *capella*, from *capa* or *cappa*, according to DUCANGE, *Gloss.*, and DURANDUS, *Rat.*, 2, x, 8, but several other sources have been suggested. A building, or such portion of a building, if less in rank than a church, as is set apart for the purpose of Divine worship under the conduct of a clergyman; and if not belonging to those who adopt the doctrines and forms of the Church of England as by law established, it is legally or popularly termed in England a chapel, although also called conventicle, meeting house, oratory, place of worship, synagogue, tabernacle, etc., which, where necessary, will be noticed under their separate heads: in France a Protestant oratorium is called a *temple*. The Roman Catholics in England had no steeple and no bell to their places of worship, in consequence of the act 31 George III, c. 32, s. 11, but this disability was repealed in 1829, by 10 George IV, c. 7, s. 26. The Templars, Hospitalers, and others, had no right to have bells to their chapels, GIBSON, *Codex Angl.*, fol., London, 1716, p. 212.

It is very difficult to ascertain the legal distinctions between a church properly so called, and a chapel having a font, a bell, and a cemetery. The act 1 and 2 Victoria, c. 106, sec. 124, defines "benefices" as all parishes, perpetual curacies, donatives, endowed public chapels, parochial chapelries, and chapelries or districts belonging or annexed to any church or chapel: yet some DONATIVES have churches, as Chester le Street in the county of Durham, and some CURACIES have churches, as Westbury on Trim in Gloucestershire, which was formerly a collegiate church; for 'once a church, always a church', appears to be a maxim of the canon law as regards the names of buildings.

The writers on canon law describe two sorts of chapels; the one, *sub tecto*, including every canonically-served oratorium built in, or structurally attached to, a church; and the other, *sub dio*, embracing every other chapel: in consequence of this last wide application of the word, reference must be made to BAPTISTERY, CEMETERY, CHANTRY, CHANCEL; and to COLLEGIATE, DOMESTIC, ENDOWED PUBLIC, EPISCOPAL, FREE, GUILD, HERMITAGE, HOSPITAL, MORTUARY, PAROCHIAL, PRIOR, PRIVATE, PROPRIETARY, ROYAL, SACRAMENT, SECULAR, SEPULCHRAL, UNION, VOTIVE, and WAYSIDE, chapels; CHAPEL OF EASE, CUBICULUM, SAINTE CHAPELLE, SHRINE, and TOMB.

Chapels *sub tecto*, as adjuncts, and not integral portions of a church, are rarely seen of earlier date than the thirteenth century even in a cathedral; in that age the services were multiplied in order to suit the time of worship convenient to the congregations, or to satisfy the privileged bodies who chose to have their own oratories; and in monasteries, where the choir was enclosed by stalls and screens, chapels were built outside the choir, so that congregations might see and hear distinctly; but the fourteenth, fifteenth, and sixteenth centuries, formed an era of the erection of chapels, especially of LADY-CHAPELS.

On the contrary, chapels *sub tecto*, forming integral portions of the dominant structure, especially absidal chapels, are known to date from the ninth or tenth century in Central France; from the eleventh century in the north and east of France; and from the twelfth century in Normandy and Burgundy. After that period chapels are found attached to the nave-aisles, both in cathedral and parish churches: it is scarcely necessary to notice the common type of a wall with a window in it joining the faces of the buttresses of these aisles. This arrangement is found in the later Jesuit churches.



MORONI, *Diz.*, s.v. *cappella*, explains it as the name of the place in which the cloaks and mantles of the saints were kept; and as the receptacle or cupboard for the moveables which prelates and nobles required in their oratories; gives the words SACELLUM, SACRARIUM, and ÆDICULA, as synonymous with chapel; and suggests that term as the translation of the Italian words *celletta* and *monistero* applied to the little chambers on the sides of a church. LUPI, *Dissert.*, i, 37, calls such a chamber an *oratorio* or *esdra* (exedra); and traces the introduction of them to ancient buildings. Some apses, sometimes called side chapels, date from the sixth century. *Illustrations*, pl. 30 and 43. ANTECHAPEL.

CHAPEL ALTARS often cause an irregularity, or carelessness as it would seem, as to the exterior of the building, when the windows are placed over the altar; for whether absidal chapels had two or four bays of walling, their altars were placed on axes parallel to that of the choir altar; exceptions occur to this rule, as at S. Denis, where the altars follow the axes of the chapels; but these exceptions frequently arise from modern alterations.

CHAPEL OF EASE. A building erected as the place for celebration of Divine Service for parishioners who live far from, or cannot find place in, the mother church. The site must be freehold, and there is no font. DISTRICT CHURCH. ENDOWED PUBLIC CHAPEL. EPISCOPAL CHAPEL. PAROCHIAL CHAPEL.

CHAPLET, or PATERNOSTER. An old name for a baguette or bead cut into the form of a string of beads, pearls, olives, etc.; it is useful as saving the use of the expression 'a beaded bead.'

1. 2.

CHAPOUR, in Farsistan in Persia, see SHAPOUR.

CHAPTER, CHAPITER, or CHAPITRE, with its diminutive CHAPETREL, CHAPITREL, CHAPITRELL, CHAPTREL, and CHAPTRELL (Fr. *chapitel*), is preserved in the present editions of the Bible for the capital (or *knoppe*, as it is called in COVERDALE'S version, the head or chapter as it is called by JUNIUS, *Nomenclator*, 12mo., London, 1585) of a pillar. It is used by MORON, *Mechanical Exercises*, 8vo., London, 1677, for the impost of an arch; while HOLMES, *Academy*, fol., Chester, 1688, iii, 459, says that the capital is the top of the pillar, and the chapter the ball or any other kind of work that is made to adorn the capital: WILLIS, *Arch. Nom.*, 4to., Cambridge, 1846, who, p. 40, 76, suggests that the word 'chaptrell' may have been applied not only to capitals of pillars, but to the hood-molds of gables with their crockets and *croques* or finials. Chapter answers to capital, and chaptrel to impost, according to other modern writers.

1. 2.

CHAPTER HOUSE or ROOM (Lat. CAPITOLIUM and capitulum; It. *capitolo*; Sp. *sala capitular*; Fr. *chapitre*, *salle capitulaire*, Ger. *capitel* (or *kapitel*) *haus*). The place of meeting of the assemblies of religious and military orders for periodical deliberations, as in the first week of May and November for the diocesan synod; for particular ceremonies, as the washing of feet on Maundy Thursday; for elections; and for the daily maintenance of discipline by inspection, obits, lecture of the domestic statutes, distribution of duties, trials, confession, and punishment. It was thus an integral part of cathedral, collegiate, and conventual churches, and its situation was necessarily prescribed: consequently, in every case where the church was served by conventual regular priests, and in most cases where it was served by cathedral secular priests, the chapter house was approached from the east side of the cloister, which was more frequently on the south side of the church than on the north; but at York, Lichfield, and Wells, the chapter house, on the north side, is approached directly from the church, not through a cloister, but through a vestibule called *TRESANTIA* or *TRISANTIA*, according to CLUTTON, *Remarks* (on which this article is founded), read at the Wiltshire Archæological Society in September 1854, and given in the *ECCLESIOLOGIST Journal*, xvi, 85. In that essay he states that the chapter house at

Durham appears to have been originally built after the manner of the eastern end, the *exedra*, *secretorium*, apse, or bema, of the early basilican churches. He also tries to establish the position that while it is very rare to find, as at Westminster, and at Thornton in Lincolnshire, any other form of chapter house than the rectangular attached to conventual churches, or even to cathedrals which were built and served by the regular clergy, and equally so to find a rectangular chapter house having arcades or stalls to the seats and step around the walls of the interior; there are no exceptions to the polygonal shape as applied to cathedral churches which were built and served by the secular clergy, whose chapter houses universally had such arcades or stalls, and a high-pitched roof like that remaining at York. A crypt is not unusual, especially in those of a polygonal shape, as at Wells, Westminster, and old S. Paul's. Between 1150 and 1300 a long and narrow chamber is not of uncommon occurrence between the transept of the church and the chapter house, or the vestibule, ANTECAPITULUM, of the chapter house, if it had one: this at Thornton abbey (Augustinian) may have been used for the purpose of holding monastic courts, corresponding to those of the consistory in cathedral chapters; it is divided into twenty-two arches or stalls, the columns of which rest upon a seat: this arrangement, but without arches, also occurs at Westminster, terminated by an altar formerly dedicated to S. Blaize. At S. Albans this is called the 'parloir', and at other places the 'slype'. A treasury was usually attached to the chapter house.

Except at Worcester (circular, and built by Norman and secular clergy), all chapter houses in England until 1150 are rectangular, as at Bristol and Much Wenlock, and groined in two or three bays without columnar support; the rectangular and ailed example at Jervaulx (Cistercian) occurs before 1200; the rectangular houses at Oxford and Chester belong to the next century; after 1250 the polygonal begins to prevail over the rectangular form; the octagon at Salisbury, preferred to those at York and Wells (and old S. Paul's), with the decagon at Lincoln (that at Hereford is ruined), are the best examples of chapter houses built by the secular clergy; the octagons at Westminster (after 1282, and exceptional as a Benedictine monastery) and at Thornton are the best specimens of those built by the regular clergy. Salisbury and Westminster are the largest existing, being about 60 ft. in diameter, with central shafts; the octagons at York (57 ft. in diameter) and Southwell have no central shaft, and therefore that at York has a groined ceiling of wood (plastered to imitate stone, *ECCLESIOLOGIST Journal*, iv, 79), which in its construction forms a part of the roof. All the remaining cathedral chapter houses in England are rectangular except Lichfield, where it is octagonal, of unequal sides, with a central column, and has an upper room which is probably a charter room. The chapter house of old S. Paul's in London is given by DUGDALE, *History*, fol., London, 1716, p. 129. The present one, situated on the north side of the churchyard, is the only English specimen of a modern building for this purpose. At Chartres the ground floor of the chapel of S. Piat now serves for the accommodation of capitular meetings. One of the most celebrated chapter houses on the continent is that (afterwards the capella degli Spagnuoli) by Fra Giacopo Talenti da Nipuzzano, to the church of Sta. Maria Novella at Florence. COTMAN, *Arch. Antiq. of Normandy*, fol., London, 1822, i, pl. 11; NODIER and TAYLOR, *Voy. Pitt. (Normandy)*, fol., Paris, 1825, ii, 114; DEVILLE, *Essai Hist.*, fol., Rouen, 1827, all illustrate the remains of the very interesting example, 1157-1211, to the abbey of S. George at Bocherville.

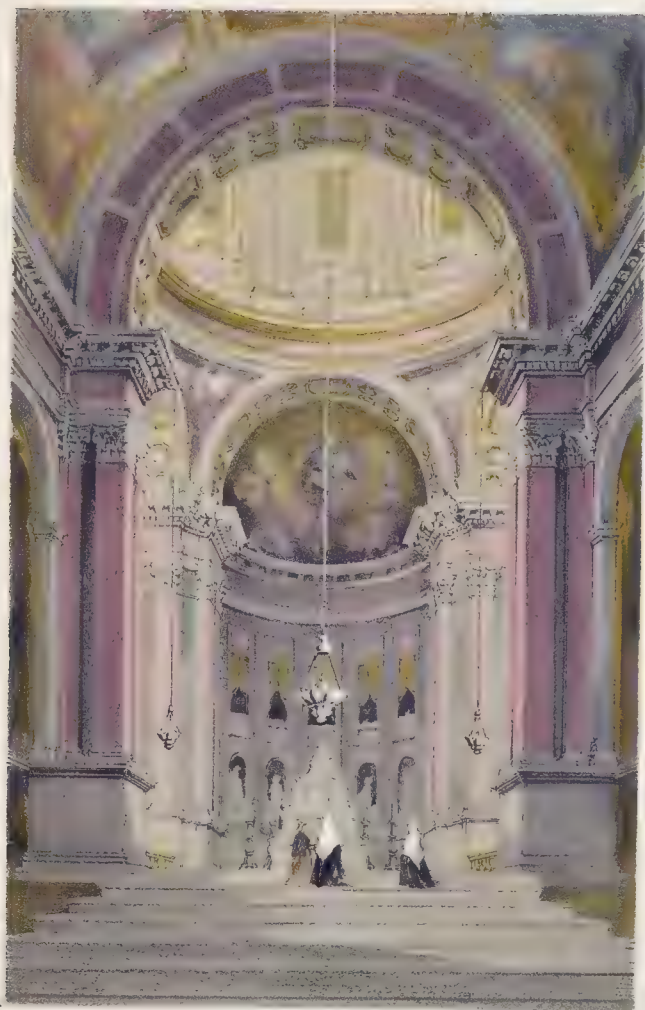
CHAR or CHARKE. The operation of carbonizing the surface of an animal or vegetable substance was called charking, whence the term charke or char-coal. Charring is used as a preventive of infection by the rot, and of the worm, in timber inserted into the earth or into a damp wall, as it impregnates the timber with the bitter particles of smoke: charring the surface should be applied only to timber already seasoned, for when







CHAPEL



CHAPEL OF S. DOMENICO  
IN VIA DI S. DOMENICO, FIRENCE





applied to green timber, it only closes up the pores at the surface, so that the internal sap and moisture cannot evaporate, and decay may begin at the centre: TREDGOLD, *Carpentry*, 4to., London, 1828. CHARCOAL.

CHAR. An old Scottish term for a weight of lead, equal to 30 pigs, each pig containing 6 stone wanting 2 pounds, and every stone being 12 pounds: JAMIESON, *Dict.*

CHARACTER (Gr. *χαρακτήρ*). A distinctive mark. The term character is applied in architecture and in art generally in two senses. In the first it is used to denote the peculiarities of a particular style or of a particular artist, sometimes broadly marked in general features, sometimes perceptible only to the practised eye in minute detail; but in either case arising from the circumstances, the genius, and the feeling of the people or the artist, and from the other legitimate influences by which the forms of art are moulded: like the idiom of language, character is the ordinary and common phraseology of the arts, and yet so subtle is it in expression, so truly the very essence of the style to which it belongs, that a perfect mastery of character can only be obtained by a thorough acquaintance with every other portion of the subject.

In the second it is applied to a work of art in the same sense as to the individual, viz. to express the evidence of vigorous and original thought, as well as of clearly defined aim and purpose, united with the technical skill and firm and facile execution which stamp the works of true genius, equally in its most simple, as in its most elaborate, productions. H. B. G.

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ARCH. PUB. SOC.

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chief apartments of the duc de la Vallière in the château de Champ, etc. BLONDEL, *Arch. Fran.*, fol., Paris, 1752, iii, 130.

CHARTER HOUSE and ROOM (in late Latin *chartophylacium*; Fr. *chartrier*). The names given to an apartment used for the preservation of valuable writings. This room was sometimes attached to a CHAPTER HOUSE as at Lichfield, and to a chapel, as in the case of the *sainte chapelle* at Paris; VIOLLET LE DUC, *Dict.*, s. v. Chapelle, p. 426, has given a restored plan of the *trésor des chartes*, in three stories, the uppermost being a charter-room, and the middle one a treasury, serving, like that on the ground floor, as a sacristy; the two lower rooms communicated each by a passage to the *haute* and *basse chapelle* respectively. RECORD OFFICE. CHARTREUSE. MONUMENT ROOM.

CHARTRES. A city, formerly the capital of the province of Beauce, and now of the department of the Eure and Loire, in France. The most remarkable objects, besides the cathedral, are the porte Guillaume, one of the two remaining gates: the remains of the church of S. André, begun 1108, and now a storehouse for hay and straw, showing a wheel window over a lancet triplet window over a late Romanesque doorway in the west end; the choir is a late addition, built for want of room upon a bridge purposely erected over that one of the two channels of the river Eure, which passes through the town: the church of S. Pierre, called S. Père, with a fine east limb which is filled with stained glass, and has an open and glazed triforium; while the triforium of the nave, which is Early Pointed work, but later than the choir, has trefoiled arches upon pilasters; its Benedictine abbey, afterwards a barrack: the episcopal residence: the new (1887) *hôtel de la préfecture*: the courts of law: two educational establishments: the library, museum, and botanic garden: and the modern theatre. A timber house (thirteenth century) given by WILLEMIN, *Monuments*, i, pl. 136, and the cage of the staircase to the maison des Ecuysers, in SOMMERARD, *Album*, ii, pl. 5, afford but a slight idea of the picturesque effect of a town, consisting chiefly of narrow and crooked streets, some of them being too steep for carriages, having plastered timber houses, with carved and pointed doorways and gables to the road.

The cathedral, dedicated to the Virgin, was of timber until a fire in 1020; the crypt under the aisles of the nave and of the *chevet*, date 1029; the works were continued until 1048, when they are said to have been stopped; yet Jean Cormier, physician to Henry I. of France, 1060, erected the south portal; and though the covering of the choir transept and part of the nave with lead was the gift of Matilda, queen of William I. of England, who died 1083, authors of eminence, as VIOLLET LE DUC, *Dict.*, s. v. Cathédrale, decide that the lower portion of the church was erected with large blocks of the hard calcareous stone from Berchère, 1100-50, and that the western towers were being constructed in 1145. A fire in 1194 damaged great part of all the work; the west façade, the north-west tower, then incomplete, and the south-west tower with its spire, were untouched; the vaulting was completed before 1220. The original choir, with two aisles and seven arches in the *chevet*, was as long as the original nave, which had also two aisles in bays of unequal width; in increasing the size of the church by the additional aisle and chapels to the choir, the same proportion was observed by moving, as at Bourges and at Paris, the western portals out to the front of their towers. Before 1250 the porches to the transept were added: and the building was consecrated 17 October 1260: the seven other towers have not been carried higher than the main walls: the sacristy dates about the end of the thirteenth century, to which period belong the fragments of the *jube* now in the crypt and in the oblong chapel of S. Piat, at the east end; this with its two external round turrets was founded 1349; the upper floor only is used for the celebration of Divine Service, a lower one serving as a chapter house. The north spire of wood, burnt 26 July 1506, rebuilt 1507-15 from the design of Jean Texier, about the same

height as that at Salisbury, is remarkable for the relief and extreme finish given to the detail of the sculpture; in 1692, 12 ft. were taken down and 16 ft. put up; it was repaired in 1754; 20 ft. of the upper portion of the south spire were reconstructed in 1395; the staircase turret of open timber work inside its tower, shown in VIOLLET LE DUC, *Dict.*, s. v. Beffroi, its bellcage, and the roof of the cathedral, were burnt 4 June 1836, the vault was not damaged, LOUDON, *Arch. Mag.*, 8vo., London, 1837, iii, 384; it has been replaced by a roof of cast and wrought iron under M. Emile Martin, at a cost of £25,000, as stated in the *BAUZEITUNG Journal*, 1849, p. 253-5, which gives the whole series of his drawings, pl. 110-12. The western doorways (the centre of which, called the *porte royale*, as being only opened for the sovereign, is decorated with the zodiacal signs and the twelve months), are given in GAILHARBAUD, *L'Arch.*, etc., 4to., Paris, 1856, and in the *MOYEN AGE MONUMENTAL*, pl. 13, which also shows, pl. 202, the transeptal triple doorways, 40 ft. high, 30 ft. wide, and 20 ft. deep, with passages in their jambs; and pl. 10, the side enclosure to the choir, which Jean Texier began in 1514; it was continued in 1611, but was not finished until 1706; the screen replacing the *jube* at the end of the choir was designed by Louis in 1772. This building, restored by the nation in 1824, is given in the *MOYEN AGE PITT.*, pl. 153, and *Mon.*, pl. 122; in pl. 246 is a careful plan; another, with views, is given by LABORDE, *Mons.*, fol., Paris, 1816-40, pl. 154-6. The visitor is carefully shown the pulpit by Guitard, 1811; the hundred and thirty windows, all having stained glass of the thirteenth century, except three of the twelfth in the western front, besides some few incomplete; the three rose windows 30 or 40 ft. in diameter; the sculpture and statues throughout; the font for immersion, of the eleventh century, in the crypt; the difference in level between the nave and its aisles; and the labyrinth in its pavement, given in WINKLES, *French Cathedrals*, 4to., London, 1837.

The dimensions (writers differ much) are, length inside 430 English ft., 418 ft., and 422 ft.; width inside 110 ft., 115 ft. at the east end, and 110 ft. at the west; length of nave 121 ft.; choir 123 ft.; width of nave 46 ft., of aisles 19 ft., and 50 ft. in height; of choir 45 ft. 6 ins.; length of transepts 202 ft., width 70 ft., 38 ft., and 15 ft. 6 ins. The height of the north-west and south-east spire is 403 ft. and 365 ft. respectively.

DOYEN, *Hist. de la ville*, 8vo., Paris, 1786; GILBERT, *Desc. hist. de l'église*, 8vo., Chartres, 1824; CHAPUY and JOLIMONT, *Cath. Fran.*, 4to., Paris, 1830; LASSUS and DIDRON, *Monographie*, fol., Paris, 1843; DIDRON, *Rapport sur le monographie*, 8vo., Paris, 1839; BULTEAU, *Descr. de la cathédrale*, 1850; POTTIER and WILLEMIN, *Monuments inédit.*, i, 54, 81, 82, 121; RAMÉE, *Histoire*, 12mo., Paris, 1843, ii, 140, 350.

CHARTREUSE or CHARTER HOUSE, see CARTHUSIAN BUILDINGS.

CHASE or CHACE. A groove in masonry, brickwork, or carpentry. In brickwork it is sometimes constructed of toothed work when made to receive at a future period a wall or pier: it is not toothed when made in one new wall to receive another, to allow of unequal subsidence in the two walls. In carpentry it is joined to the word MORTISE; PULLY MORTISE.

CHASER and CHASING. The name given to the operator and operation when gold, silver, bronze, lead, and sometimes iron and other metals, after being cast, hammered, or punched into nearly perfect shape, are formed by means of finely tempered tools into figures or ornaments. The *BUILDER Journal*, vi, 345, enters at some length on the arbitrary use of the terms "carver, chaser, sculptor, and statuary."

CHATEAU. A French word properly meaning a fortified mansion, or a CASTLE, as explained by VIOLLET LE DUC, *Dict.* s. v., in a long history of regal and baronial dwellings of the middle ages. BLONDEL, *Arch. Fran.*, fol., Paris, 1752, iv, 3, states that "château signifies at present more generally a royal house built in the country, than such a residence in a capital



LANVAIS, FRANCE



BRISAC, FRANCE

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city as the château de Louvre; but it is given nevertheless now rather indistinctly to all houses of a certain importance"—i. e. in the country; and this alteration of the meaning attached to the word has gone so far, as QUATREMÈRE DE QUINCY, *Dict. s. v.*, observes, that there are even the terms *château fort* or *forteresse*, and *château de plaisance*. The best French châteaux are illustrated in DU CERCEAU, *Les plus excellents Bastimens*, fol., Paris, 1576-9; DE CAUMONT, *Cours*, v, pl. 63 to 77; and by SYLVESTRE; BLANCHETON; BOURGEOIS; CHASTILLON; RIGAUD; MAROT; and other engravers.

CHATEAU D'EAU, see CONDUIT.

CHATEAU LONDON STONE. A very hard crystalline limestone obtained from quarries of this name, worked in the tertiary lacustrine strata of the department of the Seine and Marne. Its colour is of an indistinct cream or cold yellowish tinge, and it bears a species of polish: except in the places where the impressions or casts of shells have left holes in the stone, it is able to be worked to as fine an arris as ordinary marble. It is sawn with sand and the plate saw. Peyronnet used this stone for the bridge of Nemours: it is also employed in the parapets of several of the new bridges of Paris; in the whole of the facing of the lower part of the Arc de l'Etoile; and has been largely used in the paving, balustrades, and other ornamental portions of the churches of S. Geneviève and S. Vincent de Paul; in the basins of the Château d'Eau on the boulevards, the Fontaine de S. Sulpice, etc. The stone can be raised 3 ft. 9 ins. (English) thick, and almost of any length. RONDELET states that its specific gravity is 2.605, and that its resistance to a crushing weight is about 5,091 lbs. per inch superficial. C. R. B.

CHATEAUNEUF (ALEXIS DE), Hon. and Corr. Member R.I.B.A., was born at Hamburg 18 February 1799. After receiving instruction in 1816 from the city-architect Wimmel, he went to Paris, and thence to Carlsruhe, where he was for three years a pupil of the Oberbaurath Weinbrenner. In 1821-23 he visited South Germany and Italy, remaining a year at Rome; from the end of 1823 he was erecting at Hamburg the town residences of the brothers, the syndic, and the senator, Sieveking, besides minor works. On his return from a visit to England, France, and part of Germany, in 1828, he erected the country seat of the syndic Sieveking, the city post office, etc.; this last named work was not based upon piles, as usual in that city, but the novel construction employed was not altogether successful. In 1832 he again visited Italy, and about 1835 designed the residence of Dr. Abendroth on the Neu Jungfernstieg, his most careful work in plan, and in the combination of Greek purity in the details, with the structural forms of the Italian Renaissance; illustrations are contained in his *Architectura Domestica*, 4to., London, 1839, which consists chiefly of designs for street architecture. Much of the years 1838-9 were passed in London, preparing in conjunction with Mr. Arthur Mee a design for the New Royal Exchange, which obtained for them the second premium in the competition. *The Country House*, 4to., London, 1843, edited by lady Mary Fox, contains designs and private letters from him, explaining his views on the general principles of art, and on the question of style with relation to such a subject. As president of the commission appointed to remodel the plan of the portion of Hamburg destroyed in the conflagration of 1842, he originated many important improvements; amongst which were the arcaded porticos designed by him along one side of the Alster canal, and those flanking the square of the Exchange. A private asylum, consisting of detached dwellings in a park, was designed by him for professor Sessen near Kiel, in 1842, from which period he was engaged in the erection of numerous public and private buildings in and near his native city, such as the rebuilding, in conjunction with Fersenfeldt, of the great church of S. Peter; the residences for its clergy and other buildings connected therewith; the new post offices; the large warehouses with residences for Messrs. Schult and Schemmann, and for Mr. Davenport; a dépôt for the company of Cabinetmakers; and

ARCH. PUB. SOC.

the hall for that of the Tailors. Visiting Christiania in 1846 he was employed to restore the church of The Redeemer in that city, and to supply for another church designs which were carried out by Hanno, one of his pupils. His last work was a competition design for the Storthinghaus or place of assembly of the States of Norway at Christiania, which was too expensive for execution. He died at Hamburg 31 Dec. 1853. C. F.

CHATIYAN or SATIVEEN. The native name for the wood of the ALSTONIA. 71.

CHAUCER (GEOFFREY), the celebrated poet, born 1328, was appointed 12 July 1389 clerk of the works at the palace of Westminster, the tower of London, etc.; and at Windsor Castle; Rot. Pat., 13, Richard II, i, 30. He was succeeded by Gedney in 1391, and died 25 October 1400. BRITTON and BRAYLEY, *Hist.*, 8vo., London, 1835, p. 275; GODWIN, *Life*, 4to., Lond., 1803, p. 486, 498, 633.

CHAUFFOIR (in late Latin *calefactorium*). See COMMON HOUSE.

CHAUMERE, probably JAWMER, i. e. a stone for a jamb: WILLIS, *Arch. Nom.*, 4to., Cambridge, 1846, p. 57.

CHAVDOUR, in Asia Minor, see AIZANI and AZANI.

CHAVES, in Portugal. The modern name of AQUÆ FLAVIÆ.

CHAWNER (THOMAS), a pupil of William Leverton, had been for fourteen years in the employment of the office of the Woods, Forests, and Land Revenue, London, when he succeeded John Marquand as surveyor in 1809: became joint architect and surveyor in 1831 with Henry Rhodes; retired in August 1845, and died 6 June 1851, aged 76.

CHAYLLOWE, see CHAILLOU (WILLIAM DE).

CHECKER, CHECQUER, or CHEQUER (It. *scacchière*; Sp. *ajedrez*; Fr. *damier*; Ger. *gatter*, *querstraiß*, or *creuz-straiß*). The name popularly and correctly given, instead of diaper, to any ornament consisting in principle of quadrangular compartments formed by straight lines crossing each other at right angles: when these lines are not straight or are obliterated the ornament becomes a DIAPER; when the parallelograms are equilateral but not rectangular they are DIAMONDS; when neither they are LOZENGES. The principle of chequered work observed in tile and other pavements of all ages is commonly so in Romanesque sculptured ornament; the square BILLET, whether single or

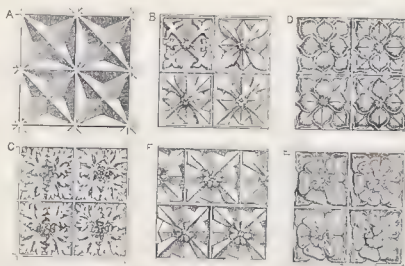


FIG. 1. A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z. A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P. Q. R. S. T. U. V. W. X. Y. Z.

double (*compony* or *counter-compony* in heraldic language), the nailhead, and the star, are only phases of it; and some good hints for its management exist on the tower arch of S. Peter's, Northampton, and other examples given in the GLOSSARY, pl. 112-115; and in RICKMAN, *Essay*, 8vo., London, 1848, pp. 115, 173, who also shows the varieties at Higham Ferrers and S. Alban's, where the squares break joint. Rich chequered work covering large spaces of walling is found frequently in buildings of the First, and less often in buildings of the Second, Pointed period; while the examples which occur in Third Pointed and Post Reformation works have little importance beyond their rarity. 11.

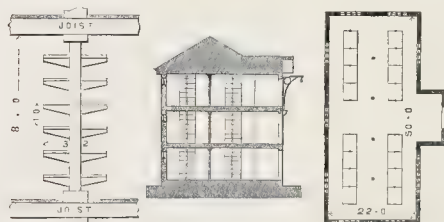
Two curious specimens of chequers in *sggraffito* are given in LETAROUILLY, *Rome Moderne*, fol., Paris, 1849, pl. 110.



**CHECKER WORK** is said of masonry, where the face of a wall is constructed with stones of uniformly square dimensions, set on their beds, and so arranged that no interruption occurs in their joints. Mixed stone and flint work of this sort occurs in Norfolk and Suffolk, and in Sussex at Steyning church. 2.

**CHEEK.** One of a pair of upright equal and similar parts of any timber work, such as the side or gusset-piece to a dormer door or dormer window (*Fr. jour de lucarne*). **JUNIUS, Nomenclator**, 12mo., London, 1585, has 'the doore postes, jambes, or cheekes of the doore': **NEVE, Dict.**, 8vo., London, 1736, s. v. Beam, speaks of 'the sides, cheeks, or relish', of a tenon and of a mortise. **BUTMENT CHEEKS.** 1. 2.

**CHEESE MARKET or HALL.** A place for the wholesale disposal of cheese by the farmer to the factor. A plan founded on that erected at Chippenham in Wiltshire, by J. Thomson, would comprise covered markets admitting the pitching of about 400 tons for each monthly market day, formed on two sides of an open area through which is a cartway, and connected by covered walks. Fronting the street might be placed public offices, or a bank; and in the rear is a room called the exchange, 35 ft. long by 20 ft. wide, accommodating about twenty buyers and sellers at one time, and furnished with ten tables and a couple of chairs to each, lighted by a lantern light, and warmed by a stove. Adjoining are urinals and closets; and in close proximity a cheese warehouse. This warehouse is three stories in height, with a crane loft, and containing about 40 tons of cheese reserved for the next market. It is lighted on each side by small openings covered with moveable louver boards to allow thorough ventilation. Each floor is 8 ft. high in the clear, with a row of iron columns down the centre, and



A and B, Plan and section of warehouse, C, Section of one of the stages.

containing two rows of stages (c) for storing cheese, formed by oak chamfered posts 4 ins. by 4 ins., and 4 ft. apart, having ash bearers mortised through the posts 4 ins. deep, lessened to 2 ins. in front, 1 in. wide, and 3 ft. 2 ins. long, thus projecting 17 ins. beyond the post; the boards are of inch elm, 17 ins. wide, elm being preferred as unlikely to impart an odour to the cheese. The shelves, placed 1 ft. apart, hold one, two, or three cheeses in height, according to thickness. An inn or hotel will generally be situate in the neighbourhood. The cheese hall at Crewe is given in the *BUILDER Journal*, 1854, xii, 319. J. T.

**CHEESE ROOM.** The place for storing cheese immediately after the manufacture, fitted up with stages of one or more shelves. The dairy room might be below the shelf room, which last could have lofts above it; because trap-doors through each floor would save risk, time, and trouble in carriage, and would be found advantageous as regards the free circulation of air, which is essential. It is sometimes recommended to be sunk two or more feet into the ground for coolness, and should then have hollow walls to prevent dampness. Little light is admitted in general. The walls should be lined with wood, for which and for the shelving, as well as for farm offices generally, the wood of the Lombardy and Abele poplars has been recommended, for the reason that mice and mites do not attack it. 1. 2. 14.

**CHEETORE**, also written **CHETTOOR** and **CHITTORE**. A town in the province of Rajpootana in Hindostan. It is considered to be "the most interesting spot for complete illustra-

tion" in India; for from the time of the last of the Mori dynasty, 727 A.D., "there is scarcely a chief of the Seesodias who has not left in Cheetore some memorial of his reign. Certainly no century has passed without a temple, a tower, or palace to serve as a landmark in its history; and in no place in India, that I know of, are so many monuments crowded into so small a space; for the fort is little more than three miles long, and nowhere more than half a mile in breadth": as observed by **FERGUSSON, Pictorial Illustrations**, fol., London, 1847, who gives, pl. 8 and 11, views of two towers: one the *Khawasini Sthamba*, or red tower, "is not only the earliest and the purest, but the most Buddhistical Jaina monument I have met with in India." This tower is about 26 ft. wide at the base, tapering to half that width at a height of 65 ft., when it again branches out to afford space for a small open pavilion of twelve columns, arranged in a cruciform plan: the external portion of the roof, though damaged, shows that it has been about 90 ft. high. Its rival, the *Jaya Sthamba*, or tower of Victory, commenced in 1451, and finished in ten years, is similar in plan and general elevation, but is 30 ft. wide and more than 120 ft. high; but the details, although "for their age they are wonderfully well executed", are inferior to the other example. Another tower, called *Akbar-ka-Deva*, or lamp of Akbar, is about 12 ft. wide at the base and 30 or 35 ft. high, erected about the time of the last sack of the city in 1568, since which it has been superseded by Oodipore. Ton, *Annals*, 4to., London, 1829, gives, i, 328, a view of the town, and mentions among the more important remains "the hundred pinnacles of the acropolis of the Ghelotes", a castle complete within itself: the gate called Rampol, and its noble *Durri khaneh* or hall of assembly: the small antique temple to Toolsi Bhavani: the *Nolhaka bindar* or treasury, a small citadel with massive lofty walls and towers, built entirely with the remains of ancient ruins, and a little but richly sculptured *sengar chaori*; the shrine of Kalka dévi (before 728): the palace of the sovereign Chitrung (before 728); its tank, which is not to be compared with that at BAROLLI, although doubtless executed under the same family: the temple to the goddess Vyan-mata, attributed with many other monuments to the sovereign Bappa Rawul, 728-764: the *Khawasini Sthamba*, to which he ascribes a date 896, or fifty years later than that allowed by **FERGUSSON**: the *mahls*, 'edifices', or 'mansions' of the Rana or sovereign Bheem, and the fair Pudmani (1275-1303); illustrated by him, i, 267, as showing the vaulted chamber, the projecting *gokra* or balcony, and the gentle batter of the walls which distinguish the older buildings: a portion of the palace (resembling the preceding), and a *mundir* or private temple dedicated to Brimba 'the creator', erected under Lakha Rana, 1373-98: the large temple erected under Rana Mokul, 1398-1419: the cenotaph of the prince Chonda (about 1425): the works attributed to Rana Khoombo Sham (1419-69), viz. two immense temples to the black god of Vrij (Christna), entirely constructed with the materials of more ancient shrines; the tower above mentioned, which he illustrates by an elevation, ii, 761, and calls *Kheerut Khoomb*, *jeyl Khumba*, or *jaya Sthamba*; the temple to Kookr-eswar Mahadeo and its fountain; the lake called Coorm-sagur; and the grand temple to Brinha: the palace of Rana Raemul, 1474-1509: the edifices (about 1568) named after the two heroes called Jeimal of Bednore and Putta of Kailwa: the *mahls* of the nobles of Sirohi, Boondi, Sont, and Lunawarra: and the palace of the Raos or rulers of Rampoura.

**CHELINI** or **CHELLINI** (GABRIELE) designed at Bologna the small church, or rather chapel of the Foundling hospital, on the west side of the strada di S. Mammolo (the hospital was removed to the Benedictine monastery of S. Procolo, on the east side, in 1797); and before 1700 the palazzo Legnani. He died about 1726. 94. 105.

**CHELLES** (JEAN DE) was the usual name of that *maitre des œuvres*, who constructed the gabled fronts of the transept and the first chapels of the choir to the cathedral of Notre Dame in

Paris, according to VIOLLET LE DUC, *Dict.*, s. v. Architecte, who gives the following inscription from the base of the south portal: Anno Domini MCLVII mense Februario idus secundo hoc fuit inceptum Christi Genitricis honore Kallensi lathomo vivente Johanne magistro.

**CHEMICAL AFFINITY.** According to the nomenclature of the school of chemistry which prevailed fifteen years ago, this term was applied to the force by which the constituent particles of bodies combine with one another; and one body was said to have an affinity for another when the two combined easily. When existing compounds were destroyed, by the introduction of other substances for which one of the previously combined bodies had a greater affinity or tendency to unite itself than with the other, it was said that in such cases an elective affinity was exhibited. Heat, extreme subdivision, peculiar electrical state, solution, light, etc., are conditions more or less necessary for the development of this force, which is always accompanied by the production of forms of matter different from those of the materials themselves, and generally speaking also by a change of colour. The term chemical affinity is little used by modern chemists, who regard the force it expresses as being simply a modification of the laws of combination.

The only cases in which chemical affinities are likely to affect the operations of builders are those before referred to in the article on ATMOSPHERIC INFLUENCE, with respect to the decomposition of woods, bricks, metals, limestones, and mortars; and likewise some operations of trade designed for the protection of building materials. In the former instances the decay arises from the affinity of the bases for the acids which are presented by the atmosphere, or by its immediate agents; and if the combinations originally existing should not be of a permanent character, or if the materials should be capable of solution, they are quickly removed. Thus water containing carbonic acid in excess will, under ordinary circumstances, take up large quantities of lime; and if the mortars, or the limestones exposed to the action of those waters, should not be in such a state of combination as to retain that base, it will be entirely carried away. It may indeed be generally stated that the mortars or limestones exposed to the influence of any waters, in fact, which contain gases in solution, must be composed of such materials as shall enable the lime to form with them insoluble salts, and the latter to exist in such energetic combination as not to have any elective affinity for the agents occasionally presented. It appears that the mechanical condition of bodies has much influence upon the exhibition of this force; for the hard crystalline limestones will resist the action of sea water, or water charged with gases, whilst the same stones, if reduced to powder, will be entirely taken up, or precisely the same chemical ingredients in another form will yield as easily; thus some marbles will resist the action of the sea (CADIZ), whilst the softer oolites, or chalk, will rapidly decay. The change of structure produced by heat upon the conditions of ordinary chemical affinity, is remarkably exemplified by the differences observable in the compounds formed between lime and the natural or the artificial pozzuolans, or in the relative strengths of Roman or of Portland cements; and it would seem that new combinations are thus formed, of whose character or permanence there exists at present but little authentic knowledge. The resistance of ceramic productions depends also upon the combinations which take place whilst they are exposed to the influence of heat; and in the more highly burnt wares these are sufficiently permanent to resist the elective affinities the various bases might otherwise possess for any of the agents to which they may be hereafter exposed.

The mutual decompositions which take place when certain solutions are brought into contact with one another, in consequence of the elective affinities of their respective ingredients, constitute the principles of the system recently introduced for the preservation of building materials; as in the case of Ransome's patent for the preservation of stone, or in that of the galvanization of iron, as it is very absurdly called. In the

former instance two solutions of earthy bases are made to decompose one another, and thus to leave upon the face of the body protected a fine insoluble glaze, able to protect it from any subsequent atmospheric action; in the latter, a coating of a non-oxydizable metal is placed in immediate contact with the more destructible iron, and opposes itself to the formation of the hydrous oxide. The protecting coat is deposited by means of a decomposition effected by galvanic electricity, and therefore it might perhaps be more consistent to treat of this process under that head. DANIELL, *Introduction to Chemical Philosophy*, 8vo., London, 1843.

G. R. B.

**CHEMISTRY OF BUILDING MATERIALS.** Although VITRUVIUS declared that the study of philosophy ought to constitute an important part of an architect's education, and devoted the whole of the second book of his *Treatise* to the description of the state of physical science upon the nature of building materials, as received in his day, the subject, so brilliantly commenced, has not subsequently been treated with the attention it merits. It is true that Duhamel, Brard, Vicat, Minard, Delabeche, Faraday, Smith, Ebelmen, Sennarmont, Kuhlmann, and others, have written detached essays upon the constitution and the chemical actions of some particular classes of materials; but no comprehensive statement of the existing state of science with respect to the whole subject can be said to exist; and unfortunately professional men are obliged to rely principally upon the empirical rules of ordinary experience. Yet the changes which are effected in the various materials employed in buildings are often of the most vital importance to the æsthetic effect and to the stability of the structures; and therefore the unsatisfactory state of knowledge upon this important subject cannot be too often or too forcibly brought under notice. An attempt has been made in this Dictionary (ATMOSPHERIC INFLUENCE) to collect the most authentic information upon that detail; the same system will be observed as far as possible in the notices of the most important materials, under the heads DECAY, DECOMPOSITION, GALVANIC ACTION, OXIDATION, ROT, SOLUTION, etc., and in those which treat of the most important chemical actions to whose effects buildings are exposed.

Without therefore at present entering upon a detailed chemical investigation of any of the materials employed in architecture, it may be stated that they may be divided firstly into the two distinctly marked classes of the organic and inorganic substances; or the woods amongst the former, and the various stones, earths, and metals, amongst the latter. In addition to the ordinary chemical actions of the bases, indeed, it is found that the durability of the woods themselves to a serious extent depends upon the presence or the absence of vitality: for so long as that inexplicable force is in operation, so long will the ordinary chemical laws be suspended; and moreover all woods are exposed to this peculiar inconvenience, that the decompositions which take place in them are often favourable to the development of the lower forms of insect life.

The inorganic substances used in architecture are divided into the following general groups, according to the classification adopted at the Exposition of Paris in 1855, slightly extended in order to embrace some objects which were then grouped in other divisions.

	Consisting of
A. Silicated rocks, or those in which silica prevails.	a. Felspathic rocks, b. Slates, c. Serpentes.
B. Quartzose rocks.	
C. Calcareous rocks, or those in which lime is the principal base.	a. Carbonates of lime, b. Sulphates of lime, c. Magnesian carbonates of lime.
D. Aluminous materials, or those in which alumina constitutes the base.	a. Kaolins, b. Fire clays, c. Brick and tile clays.
E. Metals and their alloys.	a. Iron, b. Copper, c. Lead, d. Tin, e. Zinc.



*Artificial Materials;*

- f. Limes, cements, mortars.
- g. Artificial cements.
- h. Plasters, Keene's cements, etc., stuccos.
- i. Bituminous substances.
- k. Oleaginous substances, varnishes, etc.

These materials are simply exposed to the operation of the laws of inorganic chemistry, or to the various actions and reactions which inorganic bodies produce upon one another.

Many useful hints will be found in a paper by Professor GRIFFITHS, given in the *BUILDER Journal*, 1847, v, 45, 69, 95, 119, 154; and in a series by Dr. GEORGE WILSON, given at the Architectural Institute of Scotland, and partly reprinted in the *BUILDER Journal*, xiii, 435, etc., et seq. CHAPTAL, *Chemistry applied to the Arts and Manufactures*, 8vo., 1807. G. R. B.

CHEMMIS, PANOPOLIS, ACHMIM, AKHMIM or EKHIMIM. The remains of this, one of the most considerable cities of the Thebaid in Egypt, consist of two temples, one to Mendes, the Egyptian Priapus, the Pan of the Greeks, and to Triphis, built with compact calcareous stone in blocks, of which one, 24 ft. long by 3 ft. square, bearing the name of Trajan, exhibits four concentric circles divided into twenty-four compartments, probably astronomical. It has been suggested that the remainder of this temple still remains buried in the sand. The other is represented by some blocks, larger than that above mentioned, of a whitish calcareous pudding-stone; one of these blocks, having been part of a ceiling, is thickly sown with white stars, having a red centre on a blue ground; another bears the names of Thothmos III, of Ptolemy Auletes, and of Domitian. It should be remarked that HERODOTUS, ii, 91, declares that two large statues were placed upon the propyla of this, which he calls a temple of Perseus. A great number of sepulchral chambers, some with curved ceilings as at Eilethia, one with four pilasters charged with male and female figures in basso rilievo; and other remains are mentioned by SAINT GENIS in the *DESCRIPTION DE L'EGYPTE*, iv, p. 43-65.

CHENEVIÈRES or CHENNEVIÈRE (JEAN), see LEROUX (ROLLAND).

CHENOBOSCEIUM (Gr. *χρηνοβοσκήιον*). The ancient term for a goose-yard, a provision now neglected, but one which the Romans carefully placed near a running stream, or a pond, with a good supply of herbage. It consisted of a shed open to a yard or court, *cohors*, containing the nests, *cellae, harae, speluncae*, which were from 24 to 36 ins. square, built of hewn stone or brick, and lined with straw or chaff, and also the *sginaria* or warm dark coops for fattening the young birds; COLUMELLA, viii, 13; PALLADIUS, i, 30; VARRO, iii, 10.

CHEQUER, see CHECKER or CHEQUER.

CHERENGE STONE. A very hard limestone obtained from the quarries in the ancient province of the Vexin, upon the banks of the small stream, the Viourne, which falls into the Seine near Meulan. It is worked in the lower members of the *calcaire grossier*, like the analogous stones from Vallangouyard, Saillancourt, Tessancourt, etc.; and is known amongst the Paris masons by the term *pierre à verrains*, on account of the number of casts it contains of the cerithium giganteum. The best beds are composed of a subcrystalline and tolerably pure carbonate of lime, of an agreeable and rather warm cream colour; their specific gravity on the average is about 2.16; and their resistance to a crushing weight is, according to RONDELET, between 1,400 and 2,000 lbs. per superficial inch. The Cherence stone is much used in the lower parts of the valley of the Seine, and in the Calvados, for the basements of buildings, or in positions where it would be exposed to alternations of dryness and humidity; and the ground story of the *musée* at Havre may be referred to as an instance of its successful combination for all artistic purposes with the softer Caen stone, properly reserved in this building for the more sheltered parts. The quality of Cherence stone however varies, and care is required in its selection; it can be raised in very large blocks. G. R. B.

CHERROIMBA. A dark wood of Travancore, East In-

dies, is generally about 3 ft. in circumference, and used for house building, tools, etc. CHERROPOONA is also a dark wood of the same locality, used for similar purposes. 71.

CHERRY RED. The name given to a dark red colour combined with much blue and a little brown, by ANSTED, *Elementary Course*, 8vo., London, 1850, who gives red antimony as the standard.

CHERRY TREE. The English name of CERASUS, and is also applied to EXOCARPUS.

CHERSIPHON or CHERSIPHON, see CTESIPHON.

CHELT. A term adopted to express a bed of imperfectly formed flint, frequently containing numerous shells and cavities from the decomposition of animal substances. Such a layer is always found adjoining the lower part of the top bed, as it is called, in the quarries in the island of Portland. G. R. B.

CHERUB. The name given to an ornament, consisting of an infant's head affixed to two wings, used in modern Italian architecture. Specimens of well executed decorations of this kind are carved in the church of S. Martin's-in-the-Fields, London. The idea first appears (with four wings) in Byzantine MSS. of the ninth century.

CHESTER. The capital of the county palatine of Chester, in England. It is the only entire specimen of a walled city in that country, and is situated on the river Dee. The four gateways have been rebuilt since 1769. The Roman remains consist of the foundations of the walls on the west, with a portion on the east and north sides; an archway adjoining the Julian tower at the castle; and an hypocaust in Bridge-street. The bridges consist of—1. The Grosvenor Bridge, 1827-32, by T. Harrison, is of one arch 200 ft. span, being the largest but one stone arch ever built; the width is 33 ft. between the parapets; the foundations, facings of arch, and abutments, are of Peckforton Hill stone; the springing, keying courses, and quoins, of Scotch granite; and the dry arches, of the Cheshire red stone. The works cost—the bridge, £29,300; and the embankments, £36,800. 2. The Queen's Park Suspension Foot Bridge, 1852, by J. Dredge, has a total length of 417 ft.; the centre way is 262 ft. span; it was constructed and erected in three months, at a cost of £850. 3. The old Dee Bridge, having seven arches of unequal span, was widened in 1826 by a projecting footpath on the east side; GROSE, *Antiq.* i. 4. The Holyhead Railway Bridge, 1846, by G. Stevenson, engineer, fell in 1847; ILLUSTRATED NEWS, x, 381; BUILDER and CIVIL ENGINEER Journals for 1847.

The galleries to some of the streets, called *rows*, are peculiar to Chester; the front wall is omitted at the level of the first floor, and so occupies the entire space of the front room, balustraded next the street, forming a public footpath over the shops below, with access to the principal shops on its level and also to the houses in the rear, which are approached by long narrow passages between the shops. The *rows* are continuous on both sides of the four principal streets, with flights of steps from the roadway at convenient distances. These streets appear to have been excavated, the *rows* remaining at the original level of the ground. Many examples of domestic architecture of the sixteenth and seventeenth centuries remain. Wood and plaster fronts are more general than in any other English town. Of these, a house in Watergate-street is dated 1539; Stanley House, in the same street, dates 1591, a view is given in the ILLUSTRATED NEWS, 1846, ix, 325; CLAYTON, *Timber Edifices*, fol., London, 1846, gives, pl. 24 and 25, one in Whitefriars-street, and another in Lower Bridge-street.

The cathedral, dedicated to S. Werburgh, is in the form of an irregular cross. The north and south transepts vary considerably; the latter is used as the parish church of S. Oswald. The central tower is 45 ft. square outside, and 127 high; the south-western tower, used as the consistory court, was never completed. The Norman portions, which date about 1093, consist of the lower part of the north-west tower, the north wall of the nave under the windows, and part of the north transept,

including the triforium. The choir dates from the end of the thirteenth century; the dimensions and circular end of the former choir are given in the *Journal of the Archaeological Association*, v, 18. The chapter house is vaulted, 50 ft. long by 26 ft. 6 ins. wide, and 34 ft. 4 ins. high; it dates about the end of the twelfth century; a view is given in the *Builder Journal*, vii, 366. The vestibule, 31 ft. 9 ins. long, by 27 ft. wide, and of the same date, is unique; the groining springs from slender ribbed shafts. The refectory, also of the same date, now used as the King's School, is 63 ft. 6 ins. long, by 33 ft. 3 ins. wide, and extended originally 34 ft. 6 ins. further westward; a staircase (Early English) within the south wall leads to the stone pulpit, well preserved; and the wall behind is pierced by lights of a peculiar pattern. Another staircase (Early English), on the east side of the cloisters, led to the dormitory. The cloisters date 1485-92. The lady chapel, of about the middle of the thirteenth century, is 56 ft. 9 ins. long by 25 ft. wide; the aisles, 20 ft. 8 ins. wide, have been added; these and the lady chapel are groined. In repairing the roof of the latter in 1856, the original dog-tooth cornice was discovered above the springing of the groining. The greater portion of the choir, central tower, south transept, nave, and west front, was erected from 1280-1360. The choir was extended by Thos. Jones under a portion of the central tower, and in 1846 was groined in plaster, under R. C. Hussey. Groin-springers of stone were inserted originally in the walls of the nave and aisles, choir, and south transept; and on the exterior, the springers and terminations for flying buttresses, none of which were executed. The building, erected with red sandstone, is much decayed externally. The stalls are of the fourteenth century. The bishop's throne, formerly the shrine of S. Werburgh, was restored, and a stone pulpit and screen erected by R. C. Hussey in 1846. The painted glass is modern.

The internal dimensions are:—The nave 145 ft. long by 32 ft. 6 ins. wide, 75 ft. wide including the aisles, and 78 ft. high. The choir, originally 91 ft. 9 ins. long, is now 25 ft. longer, by 32 ft. 6 ins. wide, and now 70 ft. high. The north transept 39 ft. long by 32 ft. wide; the south transept 78 ft. 4 ins. long, by 77 ft. wide including the aisles. The total internal length 348 ft. 6 ins.

Of the parish churches, S. John the Baptist, the cathedral of the Norman diocese, is mostly of Norman work, the triforium and clerestory being Early English; the choir and lady chapel are in ruins; the square detached belfry at the north-west angle is 150 ft. high; the incised slabs are illustrated in the *Journal of the Chester Arch., etc., Society*; and in BOUTELL, *Christian Monuments*, 8vo, London, 1854. S. Peter is supposed to occupy the site of the Roman Prætorium; the tower and south side were recased and the mullions renewed in 1813; the interior was restored in 1850 by James Harrison. Holy Trinity has been much mutilated. S. Michael (transition to Perpendicular) was rebuilt, except the north aisle and the roof, by James Harrison, in 1849-50, in white grit stone. S. Olave, dating from the eleventh century, and S. Martin, of brick, 1721, are not used. S. Mary (Perpendicular) is being repaired by James Harrison, it has a good panelled oak roof, and some stained glass. Christ Church, Newtown (Early English), 1838, by Thos. Jones. S. Paul, Boughton (plain), 1829, and S. Bridget (Grecian), 1827-8, by W. Cole.

The castle is of very early origin. The chapel or upper chamber of Julius Caesar's Tower is 19 ft. 4 ins. long by 16 ft. 6 ins. wide, and 16 ft. 6 ins. high; it has a vaulted ceiling, springing from columns of Early English character. The building was entirely remodeled by T. Harrison (Grecian) 1793-1820. The centre portion contains the assize court, semicircular, 80 ft. by 44 ft., and 44 ft. high; the top is a semi-dome, and coffered. The western wing contains the officers' quarters, and the eastern the barracks for 120 men and officers. All the columns of the façade are monoliths of Manley stone (HEMINGWAY, *Guide*). The other buildings of importance are:—The exchange, on

ARCH. PUB. SOC.

columns, completed in 1698; the shops on the ground-floor added, 1756; the western wing of the north front and western wall were rebuilt, and the building generally restored, in 1853, under B. Baylis, city surveyor; the dressings are of Waverton red sandstone. The county lunatic asylum, two miles distant, 1827-9, by W. Cole, jun., is of brick, with red sandstone dressings (a plan is given in HEMINGWAY), and is now being enlarged by Arthur Holme. The infirmary, 1761, had accommodation for one hundred patients; wards have since been added by W. Cole; plans are given in the same work. The savings bank (Tudor), 1853, by James Harrison, is of white Ruabon sandstone. The theatre (erected for and used as a chapel until 1488) was made into a music hall in 1855 by James Harrison; it is 108 ft. long by 40 ft. wide, and 50 ft. high; and for acoustical properties is considered one of the best in the kingdom. The news-room, 1808, T. Harrison, of white sandstone. The diocesan college, 1842 (Elizabethan), by Messrs. Buckler; its chapel, in 1845, by J. E. Grogan. S. John's or blue-coat hospital, 1717, was restored in 1854 by Messrs. Morris and Hobson, of London; the chapel of S. John the Less, of brick, forms one wing. The cemetery chapels (Norman and Elizabethan), 1850, by T. M. Penson. The general railway station, 1847-8, by C. H. Wild and — Thompson, of brick, with Storeton stone dressings, has a façade 1050 ft. in length; *ILLUSTRATED NEWS*, xiii, 100.

Four miles distant is Eaton Hall, the seat of the marquis of Westminster, 1803, by W. Porden, of Manley white stone, in a mediæval style, with additions, 1820-3, by Benj. Gummow, and considerably altered by W. Burn, 1851-3; the Grosvenor lodge, 1835, of Bath stone, is by Thomas Jones; BUCKLER, *Views*, fol., London, 1826. The gatehouse of Seighton Grange, about 1489, has a curious tower, given in ORMEROD; LYSON; and *CHESTER ARCH. Journal*. At Buera is a Norman chapel, given in the same journal.

HEMINGWAY, *History*, etc., 8vo., Chester, 1831; HUGHES, *Stranger's Handbook*, 8vo., Chester; ORMEROD, *History of the County*, fol., London, 1819; WILD, *Views, Exterior and Interior, of the Cathedral*, 4to, London, 1807-23; WINKLE, *Architectural, etc., Illustrations*, 4to, London, 1836-42; CUITT, *Old Buildings of Chester*, fol., London, 1810; *BRITISH ARCHEOLOGICAL ASSOCIATION Journal*, 1849; and *CHESTER ARCHITECTURAL, etc., SOCIETY Journal*, *passim*, which latter illustrates the Norman work of the cathedral: WEALE, *Bridges*, 8vo., London, 1843; *Trans. of INSTITUTE OF CIVIL ENGINEERS*, i; TRUBSHAW, *Account*, etc., 4to., 1836; and the *BAUZEITUNG*, 1st series, 1840, pl. 366-7, all illustrate the Grosvenor bridge. J. H. CHESTERFELD (ADAM DE), clerk of the works under William de Sleaford, was controller of the works of the new chapel of S. Stephen within the palace at Westminster, from 1355 until 1369, when he was presented to a prebendal stall there. BRAYLEY and BRITTON, *Hist.*, 8vo., London, 1835, pp. 148, 198.

CHESTNUT BROWN, also called HYPOCASTANEUM because prepared from the horse chestnut. The name given to a pigment which is a brown lake, warmer than brown pink, transparent, and rich in colour, drying moderately well in oil, and very durable both in water and in oil. 9.

CHESTNUT TREE. The English name of *ÆSCULUS* and *CASTANEA*.

CHEVAUTET or CHEVOTET (JEAN MICHEL), elected 1732 into the Academy of Architecture at Paris, is mentioned with high praise by BLONDEL, *Arch. Fran.*, fol., Paris, 1752, iii, 150, who gives his alterations for M. Perinet of a house in the rue du Faubourg S. Honoré at Paris. In 1750 he submitted a plan for the *place Louis XV*, in competition with the chief architects of the time: a selection from their designs was made and executed by Gabriel. He died 4 Dec. 1772 or 92. 45.

CHEVAY, CHEVÉ, or CHEVET (.....), died in the street, since called by his name, at Bordeaux, where he with the elder Lartigue executed about 1750 the porte de Bourguegne or des Salinières, and many other public works, under

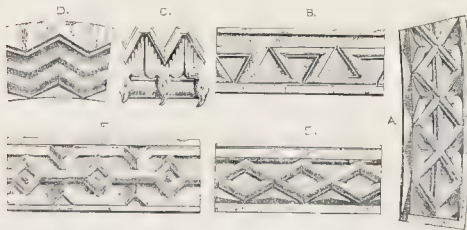


the marquis de Tourny, intendant of Guienne from 1743 till 1757. BERNADAU, *Biographie*, 8vo., Bordeaux, 1844, p. 353, and *Histoire*, 8vo., Bordeaux, 1837, *passim*.

CHEVET. A term used by French architects to denote the mass of building formed by one aisle or more, with or without chapels, around the *rond-point* or apse of the choir of a large church. The *rond-point* and *chevet* are sometimes collectively termed *abside*.



CHEVRON, also called zigzag (Sp. *zigzag*; Fr. *batons rompus*). The name of an infected boltel, bead, or baguette, either plain, filleted, or molded, forming an ornament in relief common in England and in buildings erected from the eleventh to the thirteenth century in Normandy, not a favourite ornament in other parts of Europe, and rarely found in England in buildings of very early Norman work. Although generally considered to mark Romanesque work, it is found accompanying the pointed arch during the transition from Norman to the First Pointed, as at Stoneleigh in Warwickshire, about 1190, and at Noyon cathedral and in the choir of S. Germer. About that year, it was disused as a plain chevron. The tooth ornament in the First Pointed period is only a modification of the reversed and even interlacing chevron, plain or interrupted, but forming lozenges under both conditions, applied at Kirkham priory in Yorkshire, on work said to date about 1150. The chevron was used in the Norman Saracenic architecture of Sicily, as in the cloisters at Monreale, 1174, especially on the shafts, a situation in which it occurs at S. Paolo fuori le mura at Rome; and at Merseburg, Freiburg, Zerbst, and Wechselsburg, in old Saxony.



This ornament may be described as *single*, in which condition it has even been used for the lowest member of a string-course, as at Peterborough cathedral; *interrupted single*, as at S. Bartholomew, London, about 1160; perhaps *interrupted and alternately reversed single*, also called a dovetailed fret (B), as at Ely cathedral; *single* with the spandrils filled by ornament (C); *single* either plain or with a filleted boltel, and charged with ornament; *single* with a suit of other moldings following the indentations of the chevron (D), as at the west end of Lincoln cathedral; and *single* meeting another on different planes, sometimes even at right angles: *double*, treble, quadruple, quintuple, etc., used of one or varying size, as at Ilfey near Oxford; *double interlacing*, which forms lozenges (A and E); *interrupted double*, also called a diamond fret (F), as at Lincoln cathedral, about 1140. Illustrations of all these varieties are given in the GLOSSARY, or in RICKMAN, *Attempt*, 8vo., London, 1848.

DE LA QUÉRIÈRE, *Essai sur les Girouettes*, etc., 8vo., Rouen, 1846, has illustrated the existence of chevrons, probably once gilt as only the lines now exist, on the leadwork of turrets and the bases of hipknobs, in buildings of the fifteenth and sixteenth centuries (Renaissance period). Illustrations, RIP-KNOB, pl. 90, fig. 3, and RIDGE, pl. 81, fig. 5 and 6.

CHEVRON (JEAN NOËL), born at Liège 5 October 1790, designed in that city several houses, the abbatoir, the completion of the episcopal palace, and the alteration of the former Jesuits' college into the university with its botanic gardens.

Views of the theatre (*salle académique*), of the Ionic and Corinthian orders having an octastyle Ionic portico, 1823, are given by GOETGHEBUER, *Choix*, fol., Ghent, 1827, p. 73. He also designed the *hôtel de Bains* at Spa.

CHIAPA in Mexico, see CRISTOVAL DE LOS LLANOS (SAN).

CHIAIRO-SCURO. This word, adopted in English from the Italian term composed of the two adjectives, light and dark, is only explained by the ACCADEMIA DELLA CRUSCA, as a painting in monochrome. The French equivalent *clair-obscur* is explained by the ACADEMIE FRANÇAISE as the effect of objects under direct and reflected light. This is the sense in which the word is strictly applied in relation to buildings. The pictorial imitation of this effect in a drawing is the object of the remarks by MILIZIA, *Diz. s. v.*, who, like other writers, uses the word *chiaro-scuro* generally for the quality of transparency (in the treatment of those parts in a drawing which are "shaded") the shadow within shade, the delicate modelling of forms and gradations of tint produced by the various degrees of reflected light on objects partially obscured; and by analogy a drawing is said to be in *chiaro-scuro* in which the light and shade of the object are given without projected shadow. H. B. G.

CHIAVERI (GAETANO), born 1689 at Rome, was a member of the Academy of S. Luke in that city. He was employed by the governments of Russia, Poland, and Saxony; and designed about 1744 the Catholic church at Dresden, engraved in seven plates by L. Zucchi, who also published sixty-one plates of ornaments by Chiaveri. He wrote *Breve discorso circa i danni riconosciuti nella portentosa cupola di S. Pietro di Roma*, etc., 4to., Pesaro, 1767, in refutation of the theory and practice of putting chains to the drums and vaults of domes, recommended by Leseur, Jacquier, and Boscovich, in 1743, executed under Poleni, and described by MILIZIA, s. v. Carlo Fontana. He died 1770 at Foligno. 68.

CHICA, a pigment, see CARUCRU.

CHICHARRONIA INTERMEDIA (*chicharron*). A very close wood of Cuba. 71.

CHICHEN, or 'the mouth of a well,' also called CHICHEN-ITZA, from the Maya name of the former possessors. A ruined city situated about thirty miles west of Valladolid in Yucatan. There is a general impression that it was founded 432, left 576, and refounded 936; the first settlement of the Spaniards in Yucatan was also made there in 1585. STEPHENS says that they were the ruins "of which we had formed the highest expectations, and these expectations were not disappointed, but more than realized, by a spectacle which after all we had seen once more excited in us emotions of wonder"; and that here, towards the end of his researches in Yucatan, he found for the first time in that country hieroglyphics sculptured upon stone, which beyond all question bore the same type with those at COPAN and PALENQUE: he gives the accompanying plan of ruins within a radius of one-third of a mile; several appear beyond that limit. The plan given by NORMAN differs much from this, but the descriptions correspond sufficiently to authorize the insertion of notes from NORMAN, except in regard to the circular building, on which his text appears to be erroneous.

A. The gymnasium, 'temple' in NORMAN, consists of two walls, each 274 ft. '250' long, 30 ft. '16' thick, 120 ft. '130' apart, and 'about 26 ft. high; the inner surface is finely finished with smooth stone cut uniformly in squares of about 24 ins.' In the centre of each long wall, and at the height of 20 ft. from the ground, is a large stone ring, projecting from the wall about 4 ft.: these seem to be identical in purpose with those at Uxmal, viz. for the celebration of public games with caoutchouc balls. At the south end of the east wall, and on the outer side, stands a wing '50 ft. high', consisting of two stories; the upper story had sculptured pillars '3 ft. in diameter', and its walls and ceiling were covered from the floor to the peak of the vault with paintings in vivid colours, the greatest gem of aboriginal art which has been found on the whole continent of America.

Two buildings, each at a distance of 100 ft. from these walls,

face each other, the northern one, 35 ft. long, contains a single sculptured chamber, and remains of two sculptured columns: the southern one, 81 ft. long, is similar, 'the exterior is composed of large stones beautifully hewn and laid in fillet and molding work.'



- A. Gymnasium.
- B. Pyramid.
- C. Columns.
- D. Temple.
- E. Chichanchob.
- F. Circular building.
- G. Akatzeob.
- H. The 'house of the Caciques', or *monjas* or nuns.
- I. Farm buildings.
- J. Casa Real or Caravanseral.
- K. Road from Pisté or Pisté southwards to Valladolid.
- L. Mounds of ruins.
- M. Senote or reservoir.

B. The castle, *teocalli*, or 'pyramid', measures at the base 196 ft. 10 ins. on the north and south sides, and 202 ft. on the others, '140 ft. square, and 100 ft. high, composed of blocks of immense size, lessening as the work approached the summit'; a staircase on the north is 44 ft. '30' wide, and has ninety steps, 'which narrow as they ascend.' On the ground are two colossal serpents' heads, 10 ft. in length. The platform on the top measures 61 ft. by 64 ft., and its building 43 ft. by 49 ft., '40 ft. square and 20 ft. high'. Its doorways have wooden lintels and stone jambs, all sculptured.

C. Small pillars, three hundred and eighty and more in number, placed in rows of four ranks on the south side and five ranks on the other sides of an area nearly 400 ft. square: they vary from 3 to 6 ft. in height, and consist of several pieces like mill stones. Many have been overturned in one direction. D. A small temple, on a platform about 64 ft. square, having three rooms. E. The *chichanchob*, red house, or *casa colorada*, on a platform 62 ft. long and 55 ft. wide, with a staircase 20 ft. wide, measures 43 ft. '41' long by 23 ft. '21' wide, 'the west front being quite perfect.' Above the cornice it was richly ornamented. Across the hall in front of its three chambers were beams creased as if they had been worn by hammock-ropes. 'Both these buildings were erected upon foundations of about 20 ft. in height, surrounded and sustained by well cemented walls of hewn stone, with curved angles.'

F. The circular building, dome, or *caracol*, i.e. winding staircase, standing on the upper of two terraces, is unlike any other old edifice in the country, except one at Mayapan. The lower terrace measures 223 ft. long from north to south, and 150 ft. in the other direction, '30 ft. high, and 600 ft. on the sides, constructed of fine hewn stones, and curved at the angles.' This is ascended by the twenty broken steps of a staircase 45 ft. wide, between balustrades formed of the entwined bodies of two serpents 3 ft. wide. The upper terrace is 80 ft. long by 55 ft. deep, '12 ft. high and 200 ft. on the sides', with a flight of sixteen steps 42 ft. wide: in the centre of the steps, and against the wall of the terrace, are the remains of a pedestal 6 ft. high. At 15 ft. from the last step stands a building 22 ft. in diameter and about 44 ft. high, with four doorways to a circular corridor 5 ft. wide according to STEPHENS, but here NORMAN's account differs: the doorways in the external wall of this corridor are smaller than, and face the piers between, the others; they give entrance to a second corridor 4 ft. wide, round a circular mass 7 ft. 6 ins. in diameter: the corridors had plastered and painted walls, and were covered with oversailed vaults. A great portion of the upper part of one of the sides has fallen: above the cornice the roof almost forms an apex.

G. The *akatzeob*, or 'writing in the dark', is 141 ft. '150'

ARCH. PUB. SOC.

long and 48 ft. '43' deep, rude, and without ornament of any kind: steps 45 ft. wide rose in the centre of the east side to the roof: there are eighteen apartments. The building has a recess in the centre of the long fronts, which on one side is 8 ft., and on the other 4 ft. deep. The outside and partition walls are all 3 ft. thick. H. The 'house of the Caciques', or *monjas* or nuns, is 228 ft. long; the principal structure, 112 ft. deep, and when entire 65 ft. high, had 'the corners finished off with circular blocks of a large and uniform size.' A staircase 56 ft. wide, 32 ft. '40' high, with thirty-nine steps, 'a flight of small stone steps' rises to the top of this building, and leaving a platform 14 ft. wide, rises again, having the same width, by fifteen steps to the roof of the second range, 104 ft. long and 30 ft. wide, and forms a platform in front of the third range. On the side of the staircase are five doorways, of which the three centre ones are false, being merely recesses in the wall. The compartments between the doorways contained combinations of ornaments. The two extreme doorways open into chambers, in each of which are three long recesses in the back wall, extending from the floor to the ceiling, all of which, from the remains still visible, were once ornamented with paintings. At each end of the building was another chamber with recesses, and on the south side three central doorways opened into an apartment 47 ft. long and 9 ft. deep, having similar niches.

K. The wing 'porch' 35 ft. '32' wide, 25 ft. '20' high, 'and 50 ft. deep', is totally different from the main body. In a line over the doorway were six of those well known bold projecting carved ornaments called 'hooks, with raised lines of drapery running through them', and resembling an elephant's upraised trunk, which are only paralleled in Asiatic buildings. The central tablet over the door is occupied by a keyless horseshoe arch (CATHERWOOD, pl. 21, clearly shows *voussoir* lines) in which portions of the upper part of a human figure with a headdress of feathers still remain. The rest of the ornamentation is characteristic of the architecture of the ancient American cities, i.e. it consists of the upper part, sometimes the whole, of a human face treated conventionally as ornament, and unlike the work of any other nation. 'The ornaments are composed of small square blocks of stone, cut to the depth of about 1 to 1½ in., apparently with the most delicate instrument, and inserted by a shaft in the wall. This wing has two 'three' doorways opening into chambers 26 ft. long and 8 ft. deep, behind which is another, which appears to have been originally filled up solid to the ceiling with stones and mortar. The whole number of chambers in this wing are nine, and these are all the apartments on the ground floor. To the north-east of the wing is a single chamber, called the *iglesia*, 26 ft. '22' long, 14 ft. '13' deep, and 31 ft. '36' high, in a good state of preservation, it has three cornices, and the spaces between are richly ornamented. To the south-east of the wing is a single chamber, 38 ft. '35' long, 13 ft. '10' deep, and 20 ft. high, with an elaborately sculptured front.

These great works appear to stand upon basements of rubble embedded in mortar, held together by walls, with 'round corners', of fine concrete limestone, cut in blocks about 12 ins. long and 6 ins. in breadth: the chambers are narrow, without windows, and with ceilings built in oversailing courses cut to the shape of an arch that would be pointed but that the top is flat: the most important rooms have the walls finished with a white composition, and the floors with a harder composition, which, however, shows marks of wear. In using the words 'sculptured' and 'painted', it must be understood that the walls, beams, etc., in question, are covered with hieroglyphic writing, or else with figures having rings in their noses, which appears to have been a prevalent fashion in Yucatan, for long after the conquest, the Spaniards passed laws for its prohibition. Sapote or 'zuporte' wood is 'used exclusively in these buildings for lintels and thwart-beams.' This account is considerably condensed from STEPHENS, *Incidents of Travel in Yucatan*, 8vo., New York, 1843; CATHERWOOD, *Views*, fol., London.



1844; NORMAN, *Rambles*, 8vo., New York, 1843; who together illustrate the whole of these ruins, with many details.

**CHICHESTER.** The capital of the county of Sussex in England. It is bounded on the east and west sides by a small rivulet called the Lavant. The walls, still in good preservation, and of about 1½ mile in circuit, are said to have been constructed with the materials of those of the Roman period; the fortifications were demolished in 1642. The Canongate has been considered of Roman origin, but it is probably no earlier than 1066. An Early English crypt still remains in South-street. The four principal streets are spacious and well lighted, and the houses are in general well built and supplied with water.

The cathedral, formerly dedicated to S. Peter, was during the twelve years following the fire in 1186 or 1187 so considerably repaired that in 1199 it was dedicated anew to the Holy Trinity, at which period the church consisted of a nave with single aisles, transepts, and choir with its aisles; the choir was greatly repaired 1829-30. The lady chapel, now the library, dates 1282-1304; the presbytery is somewhat similar to that at Ely, and of the same period, cir. 1230, the lower arcade is very richly carved. The south transept, 1304-39, had the roof restored to the original pitch in 1852, its great window, 1315, is 47 ft. by 27 ft.; over its porch is the bishop's consistory court, added *temp.* Henry VI, with a concealed room for prisoners; the paintings in this transept of kings and bishops are said to be by Theodore Bernardi, 1519. The outer aisles, added *temp.* Edward III or Henry III, in consequence of the increase in the number of chantries, makes this five-aisled cathedral unique in England. The north transept, formerly used as the parish church of S. Peter the Great, has in the chancel a central column, and is supposed to have been the original chapter house; a view is given in the *BUILDER Journal*, xi, 551, which also, 457, gives the 'old belfry', cir. 1217, at the south-west angle, 95 ft. high, and a good specimen of the period; the campanile or detached bell tower, unique in England as attached to a cathedral, adjoining the north-west angle, cir. 1304-36, is 120 ft. in height, the stone is said to have been brought from quarries near Ventnor, Isle of Wight. The spire, completed 1270, to the central tower, together 271 ft. high, is compared with that at Salisbury; it is 32 ft. diameter at base.

This cathedral was repaired in 1508-36, after the siege in 1642, again soon after the Restoration, and again in 1816. The repairs since 1847 have been done under the late R. C. Carpenter. The black and white marble pavement was laid down in 1731, and the nave cleared of pews and other obstructions in 1829. Painted glass by several artists has been inserted in many of the windows since 1840. Bishop Sherburne's stalls in the choir, 1508-36, eighteen on either side, and the altar screen, are of oak; the throne was put up 1830; the iron gates are given in the *BUILDER Journal*, x, 216, and an arm chair, xiii, 603. An oak chest, 8 ft. long by 20 ins. square, is known to have been brought from Selsey upwards of eight hundred years since. The shrine of S. Richard (died 1253), dating 1276, of Caen stone, was repaired, together with that to the fourteenth earl of Arundel, 1397, in 1843-6, by E. Richardson, sculptor. The oratory of bishop Arundel, cir. 1478, supports the organ, and consists of three arches surmounted by arcades and niches and richly carved roof. The principal dimensions are:—Nave 172 ft. long by 26 ft. wide, the inner aisles 12 ft., the outer aisles 14 ft. wide, making a total width inside of 90 ft. Choir 105 ft. long by 26 ft. wide; the aisles each 12 ft.; total width 52 ft. Presbytery 35 ft. long to the east window, and 39 ft. more to the lady chapel, which is 47 ft. by 20 ft. 7 ins., and 22 ft. high. Vaulting of nave 62 ft. 2 ins. high; choir 59 ft. 2 ins. high; under the great tower 67 ft. Transepts 129 ft. long by 34 ft. wide. Total external length from east to west is 411 ft. 3 ins. The cloisters, of the fourteenth or fifteenth century, are irregular in form, being on the west, south, and east sides 84 ft. long by 14 ft. 6 ins. wide, 198 ft. by 10 ft. 4 ins., and 122 ft. 4 ins. by 10 ft. 3 ins., respectively; the timber is

said to be of Irish oak. The dwelling house at the east entrance was the chapel of S. Faith, founded in the twelfth century.

The palace was repaired in 1277, and again in 1800; the chapel dates about the time of Henry III; the hall or dining room, rebuilt in the sixteenth century, is divided into two stories and possesses a good timber ceiling; the kitchen still exists. The deanery, rebuilt in 1725, cost £4,000; and the two remaining houses of the canons residentiary contain some Norman details. The parish churches are not of much interest; S. Peter the Less dates about 1229; S. Olave 1310; All Saints, or the Pallant, having only a nave, cir. 1488, was repaired 1842; S. Bartholomew, 1832, by G. Draper; S. Pancras, about 1750; S. John's chapel, 1813, by James Elmes, cost including site upwards of £7,000, of white brick, the fittings of American black birch; S. Paul, 1836; S. Andrew, cir. Henry VII; and S. Martin, restored 1820, has carved seats: there are six or seven dissenting and other chapels.

The hospital of S. Mary, for twelve aged poor, dates about the end of the thirteenth century; the chapel, 47 ft. 6 ins. long, and antechapel, together 129 ft. long, are divided by an oak screen of the time of Edward I; the span of the roof reaches within six feet of the ground; stalls are placed on each side; *SUSSEX ARCHÆOLOGICAL COLL.*, ii, 1. The prebendal grammar school, refounded about the end of the fifteenth century, is supposed to be of a much earlier date. The diocesan college and the college for training teachers, called Bishop Otter's College, 1850, J. Butler, accommodates twenty-four students. The High Cross, described by BRITTON, *Arch. Antiq.*, 4to., London, 1807, as "the most enriched and beautiful example of this class of building in England", was completed about 1500. It is octagonal with an open arcade and buttresses with finials at the angles; the total height is 50 ft.; it was repaired in 1724; the bell turret is modern; the original termination is shewn in DALLAWAY. The market house, 1807, by John Nash. The guild or town hall, formerly a chapel belonging to the Grey Friars, is 82 ft. long by 31 ft. wide, and 42 ft. high, and was converted to its present purpose in 1541. The council house, 1731, by Hawksmoor or Kent, cost £1,189. The infirmary, 1828, by George Draper, was largely increased in 1839. The assembly room, by James Wyatt, is 60 ft. by 38 ft. 6 ins., by 24 ft. high. The corn market, having a portico of the Doric order, 1832, by J. Elliott, is about 230 ft. long and 50 ft. wide. The theatre, built in 1791, is now used for stores.

In the neighbourhood are Goodwood, the seat of the duke of Richmond, greatly enlarged in 1800 by James Wyatt; Halnaker house, cir. 1534, adjoining, was partly pulled down in 1829; Boxgrove priory, founded cir. Henry I, with its fine altar tombs; and Bosham collegiate church, c. Henry II, the nave of which is of the fourteenth century.

CROCKER, *Visit to the Cathedral*, 2nd ed., 12mo., Chichester, 1849; DALLAWAY, *History of the Western Division of Sussex*, 4to., London, 1813-32; HAY, *History of Chichester*, 8vo., Chichester, 1804; HORSEFIELD, *History, etc., of Sussex*, 4to., Lewes, 1835; WINKLE, *Cathedrals*, 4to., London, 1836-42; DALLY, *Chichester Guide*, 8vo., Chichester, 1831. G. D.

**CHICKRASSIA TABULARIS** (*chittagong*). A tree of Madras. The wood is white, tough, and close grained, and but little used.

**CHIESA** or **CESA** (**CESARE DELLA**), originally a carpenter (*falegname*), designed the new *beccheria* or *maccio*, 1537; the casa Molza 'che fa angolo col Castellaro', perhaps afterwards the casa Bernardi; the church of the compagnia di S. Giuseppe, since in other hands; and the casa Rangone in the via Campanara, 1538-41; all at Modena. The date of his death is not known. 93.

**CHIETI** (the ancient Teate Marrucinorum). A city in the province of Abruzzo Citra in the kingdom of Naples. It is well built, and besides possessing the remains of an ancient theatre and gateway, contains some good public structures; the chief of which are the cathedral, dedicated to S. Tommaso

Apostolo; three other churches; the very old archiepiscopal palace; five monasteries and two convents; several other monastic, educational, and charitable establishments, especially a large hospital; a theatre; and the law courts. 28. 50. 96.

CHIEZE or CHIESE (FILIPPO DI) of Piedmont, left in 1660 the Swedish, for the Prussian, service, in which he obtained high military rank as an engineer. He designed the main buildings of the *schloss* at Potsdam (decorated subsequently by another architect); and with his cousin Lodovico di Chieze he designed after 1669 some houses on the Werder, and also the old Mint and the old Packhof, at Berlin, where he died 1673. 68.

CHIHUAHUA. The capital of the state of the same name in the Mexican Confederation. The town, founded in 1691, consists of regular streets of well built houses and edifices, and is supplied with water by an aqueduct eight miles in length, 'having a number of immense arches and an extensive reservoir.' The large and fine cathedral; a large church; the unfinished Jesuits' college of S. Francisco, commenced 1767, now the state prison; the treasury; and the town hall, are the chief public buildings. 50.

CHIJOL. A very fine wood of Mexico, used in building wharves, forts, etc., and is easily worked when green, but is said in a few years after being cut to become petrified (?) whether left in the open air or buried: *BUILDER Journal*, xi, 555.

CHILIANTHUS ARBOREUS, wild elder (*wilde elier*). A wood of the Cape of Good Hope, obtained 7 ins. in diameter, is hard and tough, and used for furniture. 71.

CHILLAMBARAM or CHALEMBARAM. A temple, situated about seven miles from the sea, in the Carnatic territory of Hindostan. It is celebrated for the buildings described by HEEREN and by BOERLEN as occupying an area of about 1350 (or 1250) ft. long by 950 (or 975) ft. wide, defined by a stone wall 30 ft. high and 7 ft. thick: FERGUSSON, *Pictorial Illustrations*, fol., London, 1847, whose description differs from other authors, says 1000 ft. long on the sides, but 750 ft. and 600 ft. on the north and south respectively. The British Museum collection possesses a general plan, with several sheets of elevations and details of this group of buildings made in 1736 by Liebaud, and two views by F. Swain Ward, which vary from the above descriptions, but agree with each other, and are accompanied by most interesting explanations. One of the gopuras, given by FERGUSSON, pl. 22, is dated by him about 990-1004. He observes that a brick outer enclosure with a stone facing, with four more gopuras, has never been completed; it was fortified with bastions, etc., by the French. Entering on the west, towards the south is an inmost enclosure, about 400 ft. each way in length: this contains the sanctuary, dating perhaps about 471 A.D., and consisting externally of a low and modern looking wall, surmounted by a heavy roof of curvilinear form covered with copper tiles; "utterly unlike any I ever saw, either in the north or south of India." Facing this toward the south, within the same enclosure, is a little shrine, dating about 927-977, and "without exception the most perfect gem of Indian art which I saw in the south." In the middle of the great court in the north portion is a splendid tank surrounded with a gallery of pillars, and a sculptured enclosure of marble. On the east of this is the hall 'of a thousand pillars', having in reality nine hundred and thirty elaborately carved granite columns 36 ft. high; these pillars date between 1695-1785. On the west of the tank is a temple dedicated to the goddess Parvati: FERGUSSON gives an illustration, pl. 19, of its porch, dating it about 927-977, and considers it the oldest building to his knowledge, except perhaps the little shrine and the sanctuary in the inmost enclosure, in the south of India. "In the north of India bracket capitals are universally used, but the system is never carried to the extent here shown"; and "nowhere can the peculiar style of this country be seen in such perfection as in this edifice." Most authors mention festoons

of chains, in length altogether 557 ft., made of stone. Each garland, consisting of twenty links, is made of one piece of stone 60 ft. long: the links themselves are rings 32 ins. in circumference, and polished as smooth as glass. One chain is broken, and hangs down from the pillar.

CHILLENDEEN (THOMAS), was elected 1391 prior of the Augustinian monastery of Christchurch at Canterbury, where either as master or colleague of Wodnesberg, who succeeded him 1411, he continued the rebuilding of the western transept and of the nave of this cathedral church, commenced and continued under the archbishops Sudbury, 1374-80, and Courtney, 1380-96, and Arundel, 1396-1413. Three sculptured heads at the intersection of the ribs of the roof of the apartment over S. Michael's chapel attached to the south-west transept, appear to have been originally inscribed Tho. Chillenden Prior, Johns Wodnesberg and Wills Molasch Discipulus. WOOLNOTH, *Illustrations of Canterbury*, 4to., London, 1816, pp. 33, 75, 170.

CHILMARK STONE. The walls, buttresses, and other substantial parts of Salisbury cathedral, and most of the mediæval buildings of that town, are constructed of this stone, as were also the religious houses of the south part of Wiltshire and Dorset. It was obtained from the quarries worked in an outlying deposit of the upper or Portland oolite, near Chickworth or Chilmark, Mill, on the river Wardour. In almost every respect the Chilmark stone appears to be analogous to the Portland stone of commerce; and when well selected, and placed with due attention to the bedding, it resists the action of the atmosphere very successfully. The means of communication with the quarries are still in a very defective state, but probably when the railway between Yeovil and Salisbury is completed, the use of Chilmark stone may be revived. Its chemical composition, specific gravity, and resistance to the various strains to which building materials are exposed are the same as those of Portland stone. The colour is of a light greenish brown, and the thickest bed to be obtained is about 3 ft. It is sawn dry when in small pieces, but like Portland stone, with sand and water when in block. FITTON, *Observations on some of the Strata, etc., in the South-East of England*, 1827; REPORT ON BUILDING STONES, etc., for New Houses of Parliament; CONYBEARE and PHILIPS, *Geology of England and Wales*, 1822. G. R. B.

CHIMÆRA (Gr. χίμαιρα). The appellation of an emblematic figure of a hill of the same name, in Asia Minor, which on one of the Lycian sculptures in the British Museum is represented as a lion with the neck and head of a goat growing out of the back: see also ILLUSTRATED LONDON NEWS, 1857, p. 139. A bronze chimæra discovered at Arezzo in 1534, and now in the Uffizi at Florence, exhibits the latter combination with the addition of a serpent's tail, DENNIS, *Etruria*, 8vo., London, 1848, ii, 346, 103, 426. This type is corroborated by the coins formerly attributed to Siphnos, but OVID, *Met.*, ix, 646, varies the description "quoque chimæra jugo mediis in partibus ignem, Pectus et ora leæ, caudam serpentis habebat." HESIOD, however, gives it the heads of these three animals with a human body. The combination of parts of animals, enumerated in the *Description de l'Égypte* (Antiquités), text i, 312; or represented in sculptures of the fifteenth century by LANGLOIS, *Stalles de la Cathédrale*, 8vo., Rouen, 1838, figs. 21, 32, 50, 56-60, etc.; although commonly called chimæras, are not to be confounded with this emblem, which, when introduced as a sculptural decoration of buildings, has been presumed to symbolize rhetoric, and also sensuality. SPHINX. But artists, since the epoch of the Renaissance, have represented the chimæra as a lioness, sometimes winged; with horns or with the eagle's, the goat's, or the human head; and the body ending with the serpent's tail, or in foliage: these combinations are frequent in what is called Raffaellesque ornament.

CHIMNEY. This term, like the Fr. *cheminée*, popularly means the whole structure of a flued fireplace, from its base to its top, like that here given from Aydon hall in Northum-



berland. The Greek word *kápuos*, and the Latin term *caminus*, appear to have meant a heap of burning fuel, large enough for culinary purposes. PLINY, *Hist. Nat.*, passim, shows that the Latin term meant the appellation of the funnel or roof, with its tube, of the fireplace. The *caminus ferreus*, *chemene*, *chymna de ferro* of the fifteenth century (SURTEES SOCIETY, *Finchale Priory*, 8vo., London, 1837, pp. 53, 279, 299) probably relate to this funnel; for CHIMNEY (It. *cammino*, Sp. *chimenea*, and Fr. *cheminée*), technically meant during the twelfth and three following centuries the funnel or hood of the fireplace. From the twelfth century to the present day a roof within the jambs appears to be almost peculiar to this country, which also exhibits in execution and in manuscripts, specimens of the external roof or hood that forms the groundwork of many of the splendid CHIMNEYPIECES on the continent. CHIMNEY HOOD; CHIMNEY HOPPER; KITCHEN.



Under the above definition, which is here adopted, several parts are included having special names, such as COVING; FIRE-PLACE; FLUE, *smoke-flue*, *tube*, *tun*, *tunnel*, or *vent*; GATHERING; HEARTH; FARGETTING; SLAB; TRIMMER; and WITH OR WITHOUT: other parts having the word chimney generally or properly prefixed, here follow in alphabetical order. The word is explained as a grate, as a fireplace, and also as a turret raised for the conveyance of the smoke, by JAMIESON, *Dict.*, 1846, s. v. Chimley and Chimblay. It is also popularly used for the *flue*; and the Act 18 and 19 Victoria, cap. 122, sec. 20, considers the chimney to be all the receptacle, below the flue, constructed for a fireplace.

CHIMNEY ARCH. An arch carrying the breast over the opening of a fireplace. CHIMNEY BAR; CHIMNEY MANTLE.

CHIMNEY BACK. There are two meanings for this word. First, the back wall of a chimney projecting outwards from the wall of a building, being opposite, but similar in every other respect, to the breast wall; and secondly, the back of a fireplace (Fr. *contre-cœur*, Ger. *rückenblatt*). PATTE, *Mémoires*, 4to., Paris, 1769, p. 146, notices the French law of putting a cast iron back against a partition or a party-wall, or else a back of tiles or brick in the first case, and a 6 inch wall of tiles or brick in the second. Tiled backs to fireplaces were discovered in the old deanery at Lincoln, and supposed to date from 1254; *BUILDER JOURNAL*, v, 440. In Berkeley and other mediæval castles, the backs are of brickwork. The cast iron back which is still found, ornamented in the styles of the seventeenth and eighteenth centuries, in some farm-houses and large mansions, as at Hampton Court, has been to some extent revived in the cast iron plates of the more expensive stove grates of the present century, and which are now being displaced by suggestions of *louvres*, fire-bricks, etc. CATHUD.

CHIMNEY BAR. A piece of —, H, or T iron, now used to carry the breast in England, and in France where it has superseded the mantle which it once supported. In England it is generally curved, and sometimes turned up at the ends for abutments to an arch carrying the breast.

CHIMNEY BREAST. There are two meanings for this word. In one case it is the front wall from base to top, of the projection, necessary for a chimney, from the inside general line of the wall to which the chimney is attached. In the other case it answers to the French term *tableau*, the wall carried up over the front of a fireplace, whether projecting or not from the main wall. This, which has replaced the mediæval hood, was formerly carried by an arch or by a mantle, and is now supported by a bar. The word breast has been explained as "that part of the wall facing the room and forming one side of the funnel or funnels", a definition vague enough to include both the above cases. The system adopted in London of building this wall only 4 ins. thick, is gradually being applied in places

where breasts 14 ins. and 9 ins. thick were usual, according to old practice, except in cottages. Fine examples of real and of false chimney breasts are instanced s. v. CHIMNEY PIECE.

CHIMNEY CORNER (Ger. *kamin stück*; Sp. *rincon de chimenea*; Fr. *coin du feu*) and CHIMNEY SEAT. The inner side of a jamb of a chimney opening where the back of the fireplace is flush with the inside of the wall of the room, and the opening is wide enough to allow a fire upon the hearth between the seats placed against the inside of the jambs; in the north of England at the present day in old houses, there is a secondary pair of jambs (CATSTONE) to a raised grate for the fire; six, seven, or eight feet, is the usual height between the floor and the underside of the mantle or mantle-tree of such fireplaces, which sometimes occupy the whole side of a room.

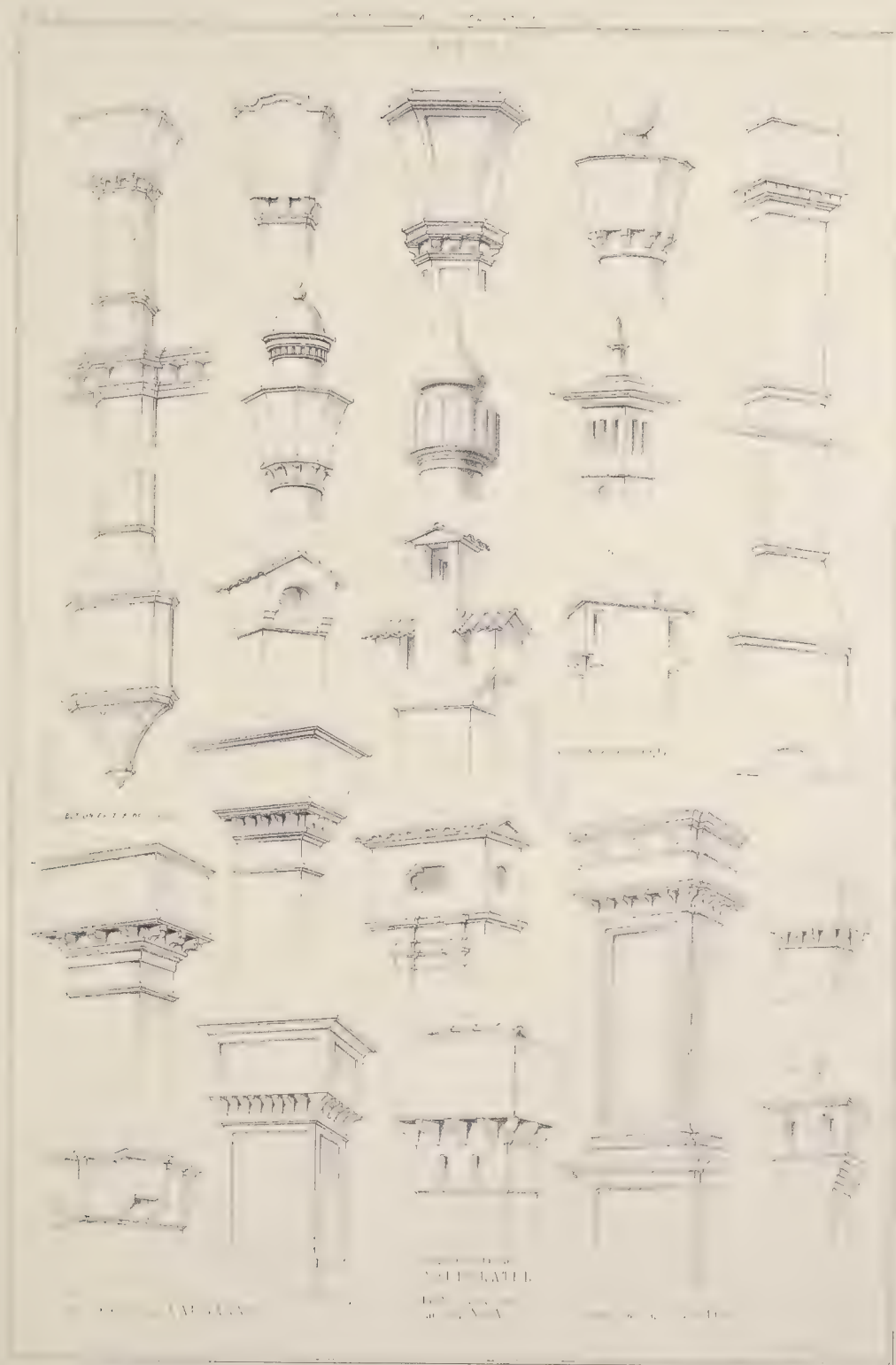
Occasionally it is a seat placed with one end against the jamb of a chimney opening where the back of the fireplace is recessed from the inside of the wall of the room; and this seat has either a wooden back with sometimes a canopy, or has a wall built behind it, which last is the most usual in Ireland. EDGEWORTH, *Absentee*, xi, describes it as the "chimney corner, behind a little screen of whitewashed wall, built out into the room, for the purpose of keeping those who sat by the fire from the 'blast of the door'". There was a loophole in this wall", as well as in the jamb above mentioned, to admit the light, at the height of a person's head sitting near the chimney, or lower, as is more common in Wales.

CHIMNEY HOOD (It. *parafumo*; Fr. *hotte*; Ger. *kamin-mantel*, *schoorsteinmantel*). The cup of the funnel, supported by a mantle over a fireplace, for the purpose of gathering the smoke into the flue; this is now rarely seen except in the hood and tunnel of a forge. The brick or stone hood was used in England during the twelfth century, as shewn in the illustrations by TURNER, *Domestic Architecture*, 8vo., London, 1851, pp. 14-15, yet JOHANNES DE MUSSIS, *Chronicon Placentinum*, speaks of a single fire, and that only in the midst of the floor of the kitchen in each house, until 1260, and even for seventy years later, unlike the *camini* of the following age: this is in MURATORI, *Rer. Ital.*, xvi, 582, who also, xvii, 46, prints the account of GATARO, *Cronica di Padova*, that Francesco Carrara, the lord of Padua, who visited Rome in 1368, employed some of his subjects to make in that city two hoods, *due nappe di camini e le arcuole in volto al costume di Padova*, because such *camini* were not in use at Rome. Illustrations of French hoods are given in VIOLETT LE DUC, *Dict.*, s. v. *Cheminée*: the construction of one of them is clearly shewn supported by a mantle-tree, and made of quartering, lathed and plastered; a system which invites a suspicion that it was as old as the time of which SUTONIUS, *Vitellius*, 8, says, "flagrante triclinio ex conceptu camini"; the dining room was burnt through the chimney's taking fire. The hood, made to a small scale in metal, has been successfully used within the fireplaces of kitchens, as a means of gathering the smoke into the flue, in fact as a secondary throat; in this case it has the form of a reversed hopper. CHIMNEY MANTLE. FORGE.

CHIMNEY HOPPER. A cast iron roof, within a fireplace, resting with a flange upon the brickwork, and gathering by a rather quick slope every way to the space left for the throat of the flue. This invention is not only useful in ensuring a proper gathering of the wings and throat, but as a substitute for the roof plate of a register-stove grate in warming the air between the throat and the top of the fire.

CHIMNEY JAMB. The wall projecting from the back to form one side of the enclosure to a fireplace, and carrying the arch, bar, or mantle of the breast, or hood.

CHIMNEY MANTLE. This word has two significations: the modern one is the horizontal portion of the decorative dressing (Fr. *traverse*) to the opening of a fireplace, under the bedmold and shelf, if there be such additions. CHIMNEY PIECE. But still as formerly the Spanish word *manteo* and French term *manteau* mean the horizontal support which in English was













## CHIMNEY

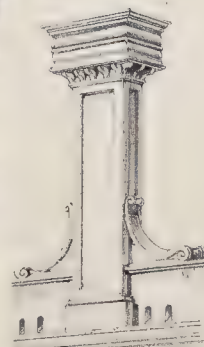
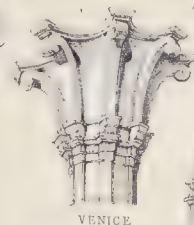


Fig. 3, 4, 11, 16, 17, 18, 19, Edward Lanson M.B.A.

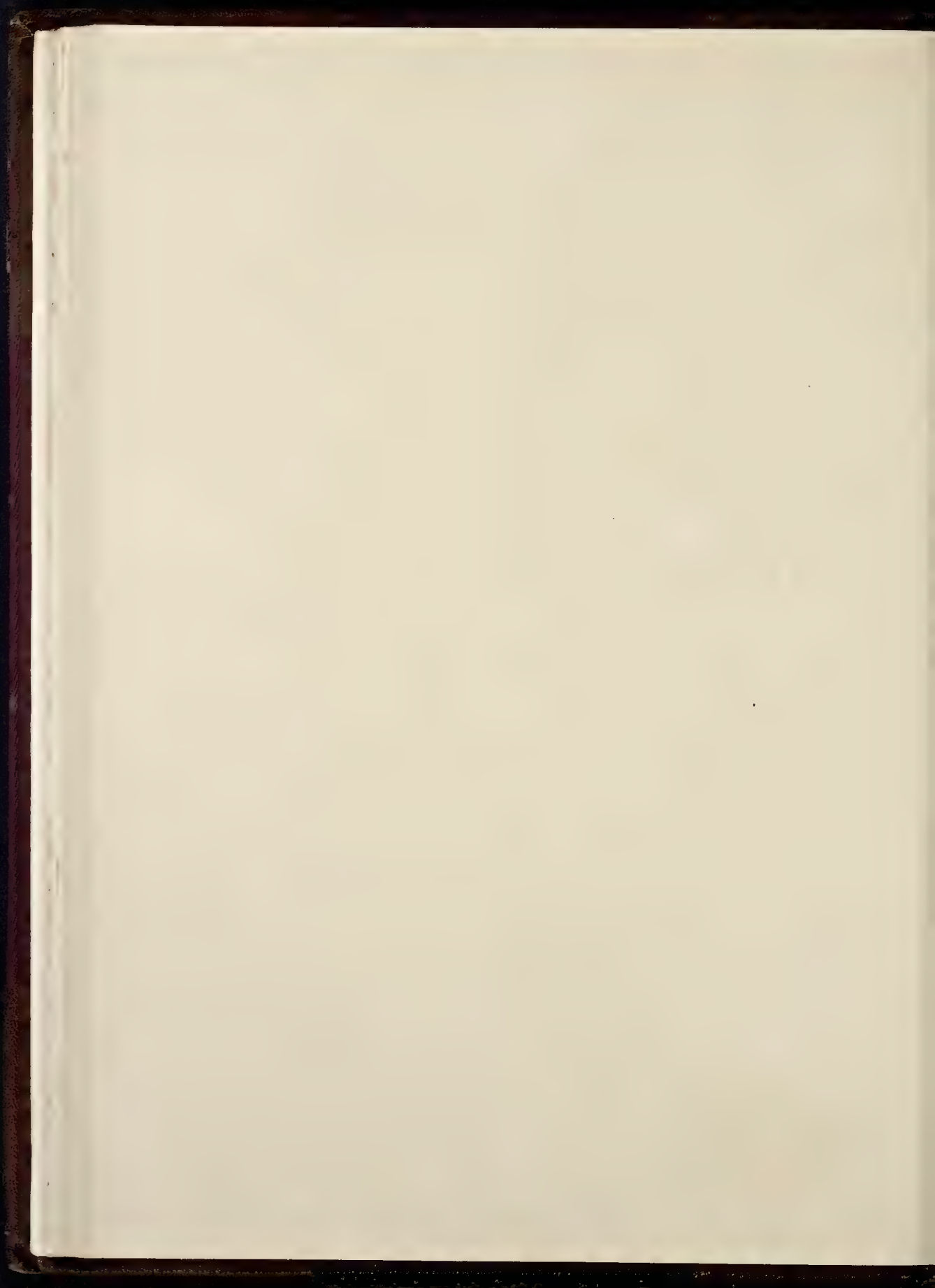
Fig. 2, 5, 6, 7, 8, 10, 14, 20, T.H. Lewis M.B.A.

Fig. 9, 12, 13, 15, 17, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

Fig. 21 Schin. John.

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Piazza Navona,  
ROMEPiazza di Campitelli,  
ROME

ROME



Via di Porta Pia, ROME



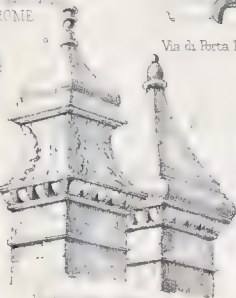
ROME



VENICE



VENICE



VENICE

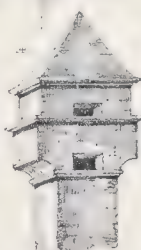


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1783

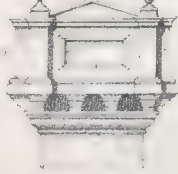
Pal. Barchini, FLORENCE



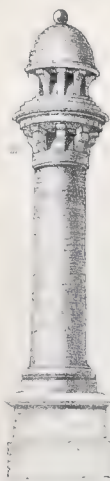
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ANTWERP

PAVIA (on Bell tower) T. Roger Smith,  
M.B.A.

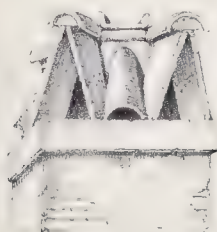
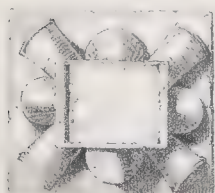
At CIGRE in Sint zeeher.



Milan, VENICE



Bedford Lith

Via Borgognona, ROME  
A. Ashpitel, M.B.A.

Plan of Fig 13

Figs 1, 2, 3, 4, 5, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

C.M.F., D. M. C. M. B. A.

Figs 6, 12, 14, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100

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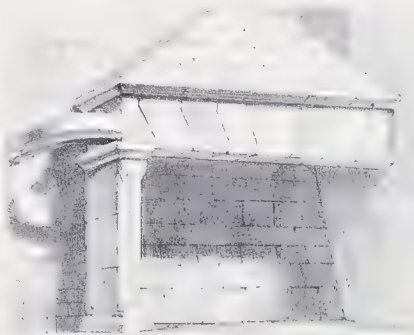
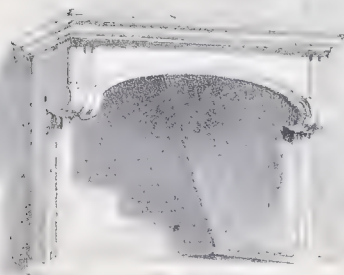
Figs 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100



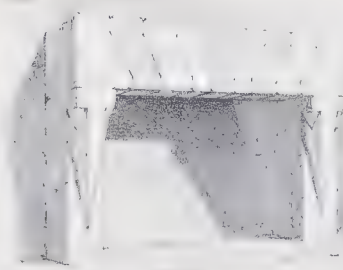
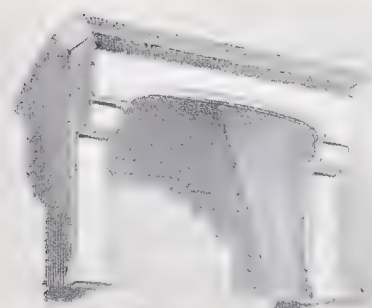




St Hall. Palace at LINLITHGOW

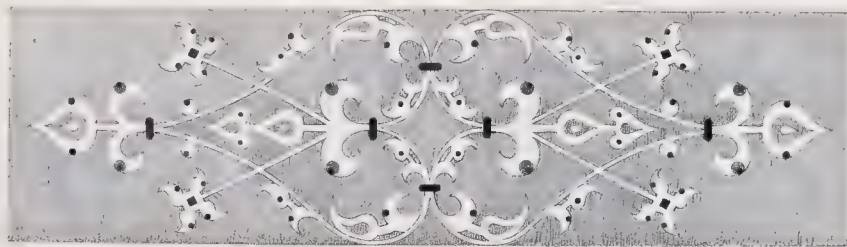
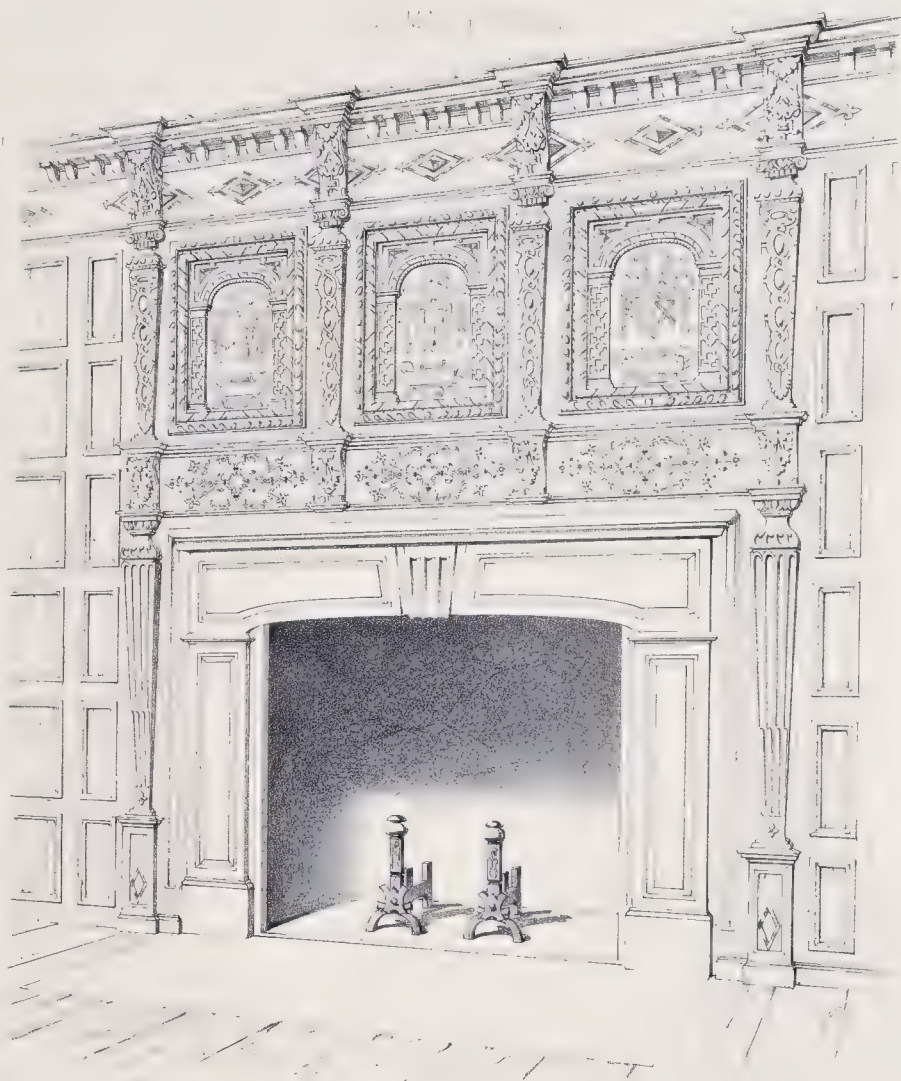


CAMEL









Inlaid Woodwork from Frieze

Boswell, SUSSEX date 1561

E. H. Martineau, M.I.A.

Lithographed for the Society by F. Bedford, June 30<sup>th</sup> 1859





called the mantle when of stone, and the mantle-tree, also termed discharging piece (*brace* in Scotland), when of timber, resting upon the jambs to an enclosed fireplace, or upon the corbels to an open fireplace, and carrying the breast or the hood. The mantle-tree was generally bedded on wooden templates, also called tassels. The stone mantle of a projecting hood was sometimes formed by an arch carried upon corbels (BUILDER *Journal*, v, 444), and upon imposts supported by columns (VIOLET LE DUC). Curious examples of level mantles are given by TURNER, *Dom. Arch.*, 8vo., London, 1853, i, 12, ii, 40, 88; MILLIN, *Antiq. Nationales*, 4to., Paris, 1799, x, 3-4; and by VIOLET LE DUC, *Dict.*, s. v. *Cheminée*. As the fireplace became wider timber was introduced, and the mantle-tree was made straight or curved on plan. Such mantle-trees, taking fire, still occasionally cause the destruction of old houses. PATTE, *Mémoires*, 4to., Paris, 1769, directs that "the mantle and throat (*manteau et gorge*) are to be carried upon an iron bar, which is not necessary to the hood of a kitchen fireplace, where the mantle is generally of wood covered with plaster of Paris." It is not unusual to find projecting brackets at the end of the mantle, probably intended to support lights.

CHIMNEY PIECE (It. *cammino*; Sp. *chambrana de chimenea*; Fr. *cheminée*, for *chambrana de cheminée*; Ger. *kaminsgesims* or *kaminsims*). A dressing or decoration in relief upon the front of the opening of a fireplace. A mantle and hood upon corbels only, have been frequently, but improperly, called a chimney piece: examples of such construction are given by TURNER, *Domestic Architecture*, 8vo., London, 1853, i, 12, 148, 154, ii, 88; by VIOLET LE DUC, *Dict.*, s. v. *Cheminée*; by WALKER, *Examples*, fol., London, 1838, pl. 16; and many others are given in PUGIN, *Specimens*, 4to., London, 1836, which equally do not deserve the name of chimney piece, because the opening for the fireplace is merely chamfered or else decorated with a sunk dressing to the top and sides. The addition of a detached cornice, as at Thornbury castle in Gloucestershire (PUGIN, ii), and in the common hall of the vicar's close at Wells (WALKER), does not give to such a sunk dressing the title of a chimney piece. In fact, ornament marking the jamb and projecting, however slightly, from the general line of the wall, is acknowledged to be essential to the modern idea of a chimney piece; and in very early times it was as much used as at present. Of this sort of decoration there are three great variations.

1. Jambs, or jamb-moldings, projecting slightly from the general face of the wall, and carrying an overhanging mantle or hood, as in the examples given by TURNER, i, 83, 84, 148, 160, ii, 40, 88; to which may be added that (about 1170) at Conisburgh castle (GLOSSARY, pl. 87), and a large number of foreign examples, such as that from the palazzo Petinelli at Padua, now in the Soulages collection, and given in the BUILDER *Journal*, 1856, xiv, 675, and those of the twelfth and fifteenth centuries, given by VIOLET LE DUC.

2. Jambs projecting fully from the general face of the wall, carrying a mantle and a hood concealed by an upright breast. A specimen of transition to this type is given by NODIER and TAYLOR, *Voy. Pitt.* (Normandy), pl. 187. One of the handsomest specimens in France of the false breast, in the museum at Dijon, is given in the MOYEN AGE MONUMENTALE, i, 40, and in the frontispiece to MAILLARD DE CHAMURE, *Voy. Pitt.*, fol., Dijon, 1835, i, rather differently to that in the BUILDER *Journal*, 1847, v, 267. The splendid chimney pieces at Courtrai (Pointed), and at Antwerp and Bruges (Renaissance), are given by HAGHE, *Sketches*, fol., London, 1840-50, and by DELEPIERRE, *Les Cheminées Monumentales*, 8vo., Bruges, 1842. Among the magnificent compositions of this kind in the mansions of the period of the Renaissance are those at Aizay le Rideau, Blois, Chenonceaux, and Fontainebleau, given in MULLER, *Sketches*, fol., London, 1841; those given by NODIER and TAYLOR, *Voy. Pitt.*, especially from the *salle du petit consistoire* in the *capitole* at Toulouse (Languedoc, pl. 23,

*bis*), from Rouen (Normandy, pl. 155, 174-5); and that from the *salle des gardes* of the château de Suilly (now called Sully), given by MAILLARD, ii, 22. This last example leads directly to the noble designs which appeared under the hands of Le Pautre. Mention should be made of those fragments arranged by Percier and Fontaine in the *salle des cariatides*, and those in the *salle de Germain Pilon* (galerie d'Angoulême), illustrated by CLARAC, *Desc.*, etc., du Louvre, 8vo., Paris, 1811, pl. 41, 42, 102-5; and of that in the ducal palace at Venice, MOYEN AGE MON., iv, 401. RICHARDSON, *Architectural Remains*, fol., London, 1840, has given some fine examples of the Elizabethan style, and a FRONTISPIECE over a chamfered opening in masonry, from the gallery at Burton Agnes. This fashion of carved wood chimney pieces endured for two centuries; RICHARDSON, *New Collection*, fol., London, 1781, frequently recommends his designs as fit for the carver: he also notices the then prevalent fashion of having "the ornaments and enrichments of a chimney piece painted on marble, either in the Etruscan manner or in various colours", such as imitation of bronze bassi-relievi.

3. Jambs carrying a comparatively low mantle, and projecting slightly from the breast, which is considered as the general line of the wall, and therefore is not decorated with a frontispiece. This sort of chimney piece occurs in very early work, as at Rochester castle, TURNER, i, 12, and at the château de Vauce, VIOLET LE DUC. The chamfered edges of an opening for a fireplace, as above described, having a boltel at the head and sides, as at Kenilworth castle, PUGIN, *Specimens*, ii, almost coincide with modern notions; which are derived from some Italian and French chimney pieces, presenting a series of moldings carried round the jambs and mantle.

Other examples are given by HADFIELD, *Ecclesiastical*, etc., *Architecture*, fol., London, 1848, pl. 79, 80; by PUGIN, *Specimens*, i, pl. 37-38, 53; *Examples*, ii; and in the GLOSSARY, which may be compared with those having hoods, formerly in the house of Jacques Cœur, at Bourges (1443-50), illustrated by HAZÉ, *Notices Pitt.*, 4to., Bourges, 1834; and the three in the chapels of the church of Notre Dame at Brou (1511-36), DIDRON and DUPASQUIER, *Monographie*, fol., Lyons, 1842.

The European taste, after abolishing the cornice in favour of a simple shelf (Fr. *tablette*), has generally adopted since the end of the last century, and continues to adopt, for most chimney pieces, the economical idea of a boxed chimney piece, or slips of marble placed on end to form hollow pilasters, with an architrave cornice, which is the lineal descendant of those last mentioned as belonging to the mediæval period; this box, avoiding the sculpture of the Italian school, rarely incurs the expense of more than large and nearly plain surfaces of marble, with the addition of brackets or trusses to the pilasters. Even the shelf is beginning to disappear, and it may fairly be dispensed with when the height of the fireplaces, as in some large town edifices, is so little that the shelf appears intended for a seat. The grand moldings used by Vignola and Le Pautre are as rarely used as the ponderous masses of stone fashionable under the princes of the Stuart race; and the utmost of present magnificence appears to be expended upon productions in a *rococo* taste from the French and Belgian workshops, which, it must be confessed, are better than the conceits, some of them executed, shown in PIRANESI, *Diverse maniere d'adornare i cammini*, fol., Rome, 1769.

CHIMNEY POCKET. A space left, for the sake of economy and lightness, between two flues, or between a flue and the end of its stack. When a fireplace is closed at the bottom, its flue (if in communication with another flue) is also said to be made a pocket. The accumulation of soot in these pockets, when set on fire, is a frequent cause of destruction of house property.

CHIMNEY POT, also called, in the northern portion of Great Britain, CAN. A top, made of potter's ware, for a flue: the term is popularly, but wrongly, applied to a CHIMNEY TOP made of copper, iron, or zinc. Although mention is made of chimney pots of various sorts, as cures for smoky chimneys,



by SAVOR, Moxon, and many others, they do not appear to have been common in England, especially in London, till about the beginning of the present century; as noticed in the GENTLEMAN'S MAGAZINE, 1804, 74, ii, 738. The great shafts of our modern chimneys, in which many flues are combined, oppose a considerable and direct obstruction to the wind, instead of turning it off, like the small and insulated shafts of former times; accordingly it has become the custom to erect round chimney pots of earthenware over each flue, with an opening of some inches between every two adjacent ones. Recently, square chimney pots, of stone, or of cement, and also affording a free passage to the wind, have become common; PASLEY, *Course*, 8vo., London, 1826; and terra cotta is now also used.

**CHIMNEY SHAFT.** This term has had several meanings. Sometimes it is used instead of *stalk*; as appears to be the case in one passage of the Act 18 and 19 Vict., c. 122, sec. 20, which, in another passage of the same section, seems to adopt the usual technical meaning, viz., that part of a stalk or of a stack which rises and has at least two disengaged sides above the line where it quits a roof, flat, or gutter, or the general top surface of the wall in which, or adjoining to which, the chimney is built. The shaft (*Fr. souche de cheminée*), under this latter explanation, has sometimes nothing but its position to distinguish it from the rest of the upper part of the chimney; sometimes it has a base marked at the two ends or all round; at other times a plain or molded cap; frequently there are both plinth and cap moldings; and generally heads, or tops of some sort to the flues, are placed upon, or, as in early examples, used instead of, the cap. The term shaft is also commonly applied to part of the ornamental finishing of the top of the chimney, now called a chimney pot. The principle in many Elizabethan and modern chimney tops, viz., of a profile that will split the wind as it drives over the top of a flue, and thus give it a tendency to suck the smoke out of a flue, is to be seen in several mediæval examples, as at Sherborne in Dorsetshire, belonging to the first half of the fourteenth century, and illustrated in the GLOSSARY. As rarefaction increases the draught, or more properly, the current impelled up the flue of a chimney, so condensation checks that draught; therefore any cause of condensation in the flue, either from the coldness or dampness of the chimney shaft, should be remedied by building its breast, back and ends, with hollow walls, if walls of at least three half-bricks thick cannot be allowed: even an external coat of cement is sometimes applied to correct the open joints caused by porous bricks and decaying mortar, so commonly found in the present half-brick or brick walls. **TUN.**

**CHIMNEY STACK.** A mass of hollow masonry or brickwork, formed by the collection together of several chimney shafts, the divisions between which are called *WITHS*. Fireplaces were rarely, even in the best buildings, placed one above another until the fourteenth century; but afterward they were built so that the flues projected one before the other into the rooms, instead of rising in the length of the wall, a plan which appears to date about the time of SAVOR, *Mémoires*, 8vo., Paris, 1685, so far as regards the part below the roof; but the architects who practised the *style de la Renaissance*, had already gathered many flues into a square, or nearly square, and ornamental shaft of a stack, as at Chambord, *Illustrations*, pl. xlv., figs. 12 and 13. In England chimney stacks of stone are not common; but at Bodiam castle (later than 1450), and at houses in South Pemberton and Lambrook in Somersetshire, are stone coupled flues, having only a with between them.

**CHIMNEY STALK.** This, or the word stalk alone, is the usual name for any very lofty chimney; but shaft is used in the same sense in the Act 18 and 19 Victoria, cap. 122, sec. 20. ARMSTRONG, in the *CIVIL ENGINEER Journal*, xviii, 319, recommends the following dimensions, commencing with a chimney suitable for a ten horse-power boiler, although a smaller engine may be required:—

Area at base	Diam. at top inside	Area at top inside
20	1 6	14
25	1 8	12
30	1 10	16
35	2 0	24
40	2 2	30
45	2 4	36
50	2 6	40
55	2 8	48
60	3 0	54

The official referees for the metropolitan buildings required that the base of the footings should be one-half wider than the base of the shaft, and be placed as low as the base of the footings of any adjoining wall or building. If the shaft be square, the height of it was not to exceed ten times the length of the side at the top of the footings; if circular, twelve times the lower diameter. The shaft was to diminish in size upwards, be at least one-third less at the top than at the bottom, and be bonded every six courses with hoop-iron, lapped at the edges. The projection at the head of the chimney, if any, was not to exceed three-fourths of the thickness of the brickwork from which it projected. The shaft, lined with firebricks to the extent of six feet at the least above the opening to the furnace, was not to be tied to or made to support the structure, but to be removable at pleasure; nor was it to be tied to any existing building or wall, and no woodwork was to be fixed in or to it.

Name	Date	Height from ground	Diameter at top	Account given in	
S. Rollox Chemical Works, Glasgow.....	1841-2	172 ft ground	40 ft	Practical Mech. Mag., iv, 191; and rents which occurred 1844	
Soda Ash Manufactory near Liverpool.....	1840	400 ft ground	45 ft inside	Civil Engineer Journ., iv, 328	
Edinburgh Gas Works .....	1845	311 ft 6 in ground	26 ft	Ditto, xiii, 308	
Cotton Factory, Shadlow Gate, Carlisle .....	1835-7	305 ft ground	27 ft octagon foundation	Louison, Arch. Mag., v, 165	
Friars Grove Chem. Works, near Newcastle-on-Tyne.....	1832-3	251 ft 9 in foundation	27 ft 6 in foundation	Civil Engineer Journ., viii, 110	
New England Glass Company, Boston, U.S. ....	1850	23 ft 0 in foundation	25 ft 0 in octagon.	Builder Journal, viii, 477	
Felling Alkali Works, near Newcastle-on-Tyne .....	—	212 ft 0 in foundation.	27 ft 6 in foundation.	Civil Engineer Journ., xiii, 110	
Caldwell Ironworks, Manchester .....	1850	210 ft 0 in ground	18 ft	Builder Journal, xiv, 22	
Stann Machinery Factory, Woolwich .....	1840	207 ft 0 in ground	18 ft circular.	Papers of Corps of Royal Engineers, ix	
Ditto .....	1840	207 ft 0 in ground	18 ft circular.		
Stann Flour Mill, Thames street, London .....	1840	160 ft ground	12 ft 4 in	Builder Journal, viii, 110	
Camden Town Station of North-Western Railway .....	1847	132 ft 4 in ground	13 ft	Stimms, Pub. Works, pl. 6; Brees, Gloss, p. 105	
Thomas Cubitt's Works, Thames Bank, London..	1845	108 ft ground	7 ft 4 in	Builder Journal, iii, 62	
Royal Arsenal Woolwich, (contrib. by Messrs. Lucas.)		ground	placed in sq. tower		
"New Shell Foundry.....	1850	223 ft	11 ft 9 in	5 ft 6 in	All these have octangular shafts.
"Boring Mill.....	1850	170 ft	13 ft 1 in	5 ft 6 in	
"Rocket Buildings.....	1850	150 ft	11 ft	4 ft 0 in	
"Saw Mills of Carriage Department.....	1850	130 ft	10 ft	4 ft	Builder Jl. xiii, 626.
"Paper Factory.....	1850	120 ft	10 ft 3 in	5 ft 9 in	

Small stalks are now made of plate iron tubes, in lengths of about 47 inches, held upright by iron stayrods from the ground to about half the height of the chimney. A paper by R. Rawlinson, read at the Liverpool Architectural Society, on 'Chimney Construction', is given in the *Builder Journal*, xv, 120, and other magazines for February 1857.

**CHIMNEY THROAT.** The opening by which the flue of a fireplace communicates with the top of the gathering of the wings. Such phrases have been printed as 'the part between the gathering and the flue', which does not exist, as the gathering and flue meet each other. **CHIMNEY HOPPER.** RUMFORD first advocated the width of the throat being reduced to 4 in., or even less, between the breast and the back; while the *Scientific American* states, "on reliable authority, that if, at two feet above the throat of the chimney, the opening is enlarged to double the size for a space of two feet, and the rest carried up as at the first, the chimney will never smoke." In the *CIVIL ENGINEER Journal*, xiii., 334, an old plan is advocated as new, which consists in giving the wings a convex, not

a concave, gathering, and building the flue central and perpendicular for the first two or three feet. The writer adds, that gathering the flues over all in one direction, without returning them in another, is now exploded.

**CHIMNEY TOP** (Ger. *kamin kappe*). Some dictionaries explain this term as the horizontal upper surface of a chimney shaft. As above explained, the **CHIMNEY SHAFT** (as it is technically understood) of a stalk, or of a stack, frequently had, and now almost always has, a capping, even if that be only a tile creasing: besides which, a head or top of some sort (chimney pot) is generally placed upon this capping over each flue. In early examples, as in the illustration from Aydon Hall, *s. v.* **CHIMNEY**, this head, not rising above the general line of the wall to which it is attached, finishes the chimney without the intervention of any shaft: sometimes it finishes the shaft without the intervention of any capping. In process of time this head has increased from an ornamental finial into an independent fixture, having a shaft of its own more or less decorated, sometimes with base moldings, at other times with a cap, and generally with both; besides having its own cresting with or without a roof. Examples are given by TURNER, *Domestic Architecture*, 8vo., London, 1853, *passim*; in the **GLOSSARY**; by PUGIN, *Specimens*, fol., London, 1823; and *Examples*, fol., London, 1831; BRITTON, *Dict.*, 8vo., London, 1838; and by VIOLETT LE DUC, *Dict.*, *s. v.* *Cheminée*. The ARCHITECTURAL PUBLICATION SOCIETY, *Illustrations*, pl. iv, xvi, and xlv, has given about sixty hitherto inedited sketches of chimney tops. In Italy the bricklayers construct tops with flat and curved tiles, according to the situation of the house.

**CHIMNEY WAIST OR WASTE**. An old term for the throat of the chimney where the cup of the funnel was entered by the flue.

**CHIMNEY WING**. The name for each gathering side of the roof of a fireplace, rising from the top of the jamb (generally on the level of the mantle) to the throat of the funnel, and connecting the breast with the back of the chimney.

**CHIMU-CANCHU** (Palace of), see TRUJILLO.

**CHINA WHITE**. An earthy white pigment, probably prepared from carbonate of lime in the state of white chalk. 9.

**CHINBEAK**. The name appropriated to a molding which in section forms an ovolo, or an inverted ogee, with or without a fillet under it, followed by a hollow. It is common in buildings and decorations dating from the time of the Renaissance. BASIN, BEAK, BIRD'S BEAK, LIP, NOSE.

**CHINCHONA GRATISSIMA** (*tungnusi*). A wood of Nepal; coarse in quality, used for posts and rafters. 71.

**CHINCING OR CHINSING** (to Chinse). An old term still used for thrusting oakum or lead with a pointed instrument into the seams or chinks of planking or masonry; ARCHITECT *Journal*, 1850, ii. 346. CAULKING. 23.

**CHINESE ARCHITECTURE**. See *Detached Essay and Illustrations*.

**CHINESE LAKE**. A red pigment used in oil colours, its base is the cochineal extracted from the shreds of scarlet cloth. 9.

**CHINESE VERMILION**. A native CINNABAR, found in China so pure as only to require grinding to become a very perfect red pigment, used both in water and in oil colours. 9.

**CHINESE WHITE**. An oxide of zinc forming a good white pigment for water and oil colours. HUBBICK'S ZINC WHITE.

**CHINESE YELLOW, KING'S YELLOW, OR YELLOW ORPIMENT**. A sulphuret of arsenic procured from China, and used in oil and in water as a pigment which is very bright, but susceptible of alteration by mixture with lead. 9.

**CHINGAIL**. The regulation land measure used in the district of Coimbatore in British India. It is however of very uncertain length, as the extent varies with the length of arm in the person who makes it. BUCHANAN, *Travels*, 4to., London, 1807, ii. 208, 253, found it reckoned at 108 ft. long by the

natives, who measured with one 102 ft. 8 ins. long. He gives

6 ft. 6 ins. = 1 mar.
104-0 = 16 mars = 1 chingali.
173,066 sq. ft. = 4 chingallis square = 1 bulla.

**CHINIKHANA** or **CHINIKHĀNĀ**. An Hindostanee term for a niche or ornamental recess, of which twenty-nine examples are given by KITTOE, *Illustrations*, fol., Calcutta, 1838.

**CHIOGGIA** or **CHIOZZA**. A seaport city in the government of Venice in Austrian Italy. The principal street is connected with the mainland at Brondolo by a causeway 250 paces long, having forty-three arches. The cathedral, under the invocation of the Assumption, rebuilt 1633 by Baldassare Longhena, has a high detached campanile, a fine pulpit, and one of the most celebrated marble fonts in Italy. Two other churches, the episcopal palace, a *palazzo governativo*, repaired 1544, five educational, etc., establishments, a custom house, the *palazzo Grassi*, and a theatre, are the chief buildings. The *murazzi, argini del mare*, or sea walls, commenced in 1751, and recently (1842) repaired, with a slope of 4 to 1 on the sea face, deserve their inscription, "ausu Romano ære Veneto." 28.50.96.

**CHIONA** (CRISTOFORO) is entered under the date 18 July 1406 in the list of architects to the cathedral at Milan. 27.

**CHIOS MARBLE**. A marble from the island of Chios, much used by the ancients, which had a diaphanous black ground with various coloured spots. PLINY, *Hist. Nat.*, xxxvi, 6; BLASIUS CARYOPHILUS, 20.

**CHIP** (It. *coppioni* (pl.); Sp. *astilla*; Fr. *copeau*; Ger. *stückchen* (pl.), *span*). A piece cut from wood by an axe, a chisel, or a knife; a piece similarly cut from stone or marble is called a 'gallet', 'gellet', or 'gullet' (Sp. *brizna*).

**CHIP AXE** (Fr. *doloire*, especially for a cooper's adze; Ger. *breit-axt, breit-beil, schlacht-beil*, because as at the present day round Ratisbon, a hatchet with a wide curved blade was the German instrument for smoothing timber, etc.) **AXE, BROAD AXE, CHISEL.**

**CHIPOLIN PAINTING**. The most elegant kind of distemper painting, but the operations it requires render it very expensive, and it is therefore reserved for apartments in palaces. The process is described in TINGRY, *Painters' Guide*, 8vo., London, 1816, with its imitation. The process termed *Blanc de roi*, or royal white painting, is also given.

**CHIPPING PIECES**. Projecting pieces cast on the face of one piece of iron work that is intended to touch, but not to lay close to, another.

**CHIRAZ**, in Persia, see SHIRAZ.

**CHIRISOPHUS** of Crete is mentioned by PAUSANIAS, *Desc.*, viii, 53, as having built the temples to Ceres and Proserpine, to the Paphian Venus, and to Apollo (in which last his own statue was placed) at Tegea in the Peloponnesus. He lived about 500 B.C.

**CHIRRIA, CURRIA, OR TORA**. The term used in Hindostan for a stone bracket or corbel, of which fifty-two examples are given in KITTOE, *Illustrations*, fol., Calcutta, 1838.

**CHISEL** (It. *scarpellone, scarpello, sculpello*; Sp. *escoplo* for wood, *cincel* for stone; Fr. *ciseau*; Ger. *meissel*). The name given to several sorts of a tool, having a cutting edge at the base of a metal blade, and an upper part prepared to receive blows or impulse from the hand, or from a hammer or a mallet.

For rough work, such as separating the parts of wood-work that have been nailed together, carpenters use a *ripping-chisel* (Sp. *punta corriente*), which is generally an old *socket-chisel*: their *socket-chisel*, or *heading-chisel*, as it is called in the country, is commonly about 1½ or 1¾ ins. wide in the blade, and is employed in cutting mortises, etc.: it is so called because the top is formed into a conical socket, for a wooden handle, which socket is resolved into the square at the head of the blade: from this square the blade widens downward on the faces, but narrows on the sides; one face of the blade consists of steel, the other of iron; the end being ground into the form



of a wedge, forming the basil on the iron side, and the cutting edge on the lower end of the steel face. They finish, when necessary, their work with a *mortise-chisel*, having also an iron back and steel face narrower than the sides of the blade; the angle made by its basil with the under side is about  $45^\circ$ ; at the top of the blade there is formed a neck, generally square, carrying a shoulder or button, and continued by a prong which enters a wooden handle.

Joiners commence with the *mortise-chisel* (Fr. *besague*); and continue with a *firmer* or *former-chisel*, also called *side firmer*, as it clears out the core and rags from the sides of the work; the blade is now made equally wide from the neck to the basil, and has the basil upon the face and not upon the side of the blade: in other respects it resembles the mortise-chisel: their *sash-chisel* is only a small variety of the mortise-chisel. Joiners finish their work with a *paring* or *pairing-chisel*, which is entirely of steel, and is lighter than the *firmer*. Their *drawing knife* is an oblique ended chisel for drawing in the ends of tenons, by making a deep incision with the sharp edge, guided by the tongue of a square; it is also called *scribing knife*.

Carvers and turners also use, chiefly without the hammer, the *firmer* and the *paring-chisel*, as well as the *skewback-chisel*, which has a flat blade, skewed in a small degree at the end, and bevelled from each face at the end, so that the cutting edge is in the middle of the thickness of the blade, in order to work cleanly into acute angled corners.

The names of these tools have altered with the fashion of their shape, during the last century, in which the *firmer* or *former* (Sp. *formon*; Fr. *fermoir*) was used as the *paring-chisel*, and then the *mortise-chisel* (Sp. *escoplo*; Fr. *ciseau*) was the representation of the tool.

Bricklayers use the *ripping-chisel*, the *iron-chisel*, which is a small crow-bar, and the masons' chisels.

Masons have a peculiar form of chisels, called 'tools' by them, being in general 6 or 7 ins. long, and the same in shape as the lower half of the *socket-chisel* (the place of the conical socket is supplied by a button or head, both for the large and small ones), but having a sort of bulb in the middle of the length of all those under 1 in. wide, so that when the chisel is laid down the upper wedge, containing the head, may be the heaviest, and overbalancing, may keep the cutting edge from touching any surface. They are chiefly called the broad *boaster* or broad *batt tool*, from  $4\frac{1}{2}$  to 3 ins. wide at the cutting edge; the *boaster*, 3 to 2 ins. wide; the *inch* and *inch and a half*, etc., *tool*; and the *point*, from  $\frac{1}{2}$  up to  $\frac{3}{4}$  in., but generally, sizes from  $\frac{1}{4}$  up to  $\frac{3}{4}$  in. are preferred, especially for concave work; whereas for convex work no tools less than  $\frac{1}{2}$  in. wide are used where there is space enough to work them: all these are basilled from both faces. A chisel about 2 ins. broad with a stump point is used for squaring Yorkshire paving, and is called a *pitching tool*.

Smiths use chisels similar to those of the masons, but shorter, in order to cut iron.

All these chisels are also distinguished by the width of their blades, expressed in inches or parts of an inch. 1. 2. 4.

The bronze chisels of the ancient Egyptians are described by WILKINSON, *Manners*, etc., 8vo., London, 1847, iii, 169-172. The old French tools of this sort are described in VIRLOYS, *Dict.*, s. v. *Ciseau*, etc.

**CHISELLED WORK** or **STRIPED WORK**. The term used by masons for one of the final operations in working a face to a block of stone. The stone first rough, is then scapled, scalped, or hammer dressed, then broched and squared with a pickaxe, and then axed, or else wrought with a broad chisel, to remove the pick-marks: in this state the work is called random tooled, or droved if the broad chisel has left irregular lines; and boasted if the lines are regular: when the face shows marks, of a narrower chisel, regular and parallel to each other, the work is said to be tooled or broached if  $\frac{1}{8}$  of an inch or less apart, and when they are much less, say down to  $\frac{1}{16}$ , the work is described as chiselled or striped. When the marks or 'bats' are

still nearer, the work is said to be pointed. For both striped or chiselled and pointed work, the stone should be previously droved, i. e. faced with the *boaster*: this, although always done in former times, is now generally omitted by northern masons, although they might be allowed to execute droving for these two processes with less care than they would give to it if it were to form a finished face.

CHITTAGONG WOOD, see CHICKCRASSIA.

**CHITTORE**. A town in the Carnatic territory in Hindostan, celebrated for about 600 acres of very remarkable antique tombs, of which neither history nor tradition exist: enormous slabs of granite laid as floors, walls, and roofs, contain a sarcophagus covered with 3 or 4 ft. of earth. 50.

**CHIURACY**. A brown wood of Penang, is used for beams, but it does not work kindly. 71.

**CHIUSI** (Etruscan CAMARS, Latin CLUSIUM). A city in the province of Siena in Tuscany. The architectural antiquities chiefly comprise uncemented travertine walls in *opus quadratum*, not *isodorum*, of small blocks, rarely exceeding 3 ft. in length, and never so much as 2 ft. in height: and some vaulted passages and chambers under the present town. The necropolis, in extent and in the variety, singularity, and rich decoration of the sepulchres, is only second to that of Tarquinii: the tombs are chiefly entered on a level, and not by a descent as at Cervetri, Corneto, and Vulci. Chiusi possesses the only specimens of a pair of Etruscan folding doors, working on their original pivots. Each door is a single slab of travertine stone 52 ins. high, 18 ins. wide, and 4 ins. thick. The openings diminish in width upward, and have the usual Etruscan moldings. The ceilings are not imitations of rafters or joists, but are coffered in concentric square and oblong figures painted black and red. An arched vault 9 ft. 9 ins. wide, of uncemented blocks from 10 to 18 ins. high, and from 30 to 40 ins. long, and a segmental relieving arch over one of the doorways, are described by VERMIGLIOLI, *Descr. del deposito*, etc., Perugia, 1819. A mound about 300 ft. in diameter and 50 ft. in height, with groups of tombs in terraces or tiers, having beamed as well as coffered ceilings, is claimed as the mausoleum of Porsena: BRAUN, *Laberinto di Porsena comparato coi sepolcri di Poggio Gajella*. The city is celebrated as a museum of those round pedestals or cippi, sometimes supposed to be altars, which next to the bronzes are the earliest and most genuinely national works of the Etruscan chisel. There are also catacombs of the early Christians. The cathedral, dedicated to S. Secondiano (others say to Sta. Mustiola), is chiefly remarkable for eighteen antique columns of different sizes: DENNIS, *Cities*, etc., 8vo., London, 1848, ii, 324-361.

**CHLOROXYLON** SWIETENIA, or SWIETENIA CHLOROXYLON, yields the satin wood, also called green mahogany, of the East Indies and Ceylon (*hurrugulu*). The best quality is the West Indian (*maba*), imported in square logs and planks from 9 to 20 ins.; next the East Indian, in round logs from 9 to 30 ins., and the inferior in square sticks from  $3\frac{1}{2}$  to 10 ins. The wood is hard, close, heavy, durable, of an orange yellow colour, and sometimes obtained very beautifully mottled and curled. It was formerly much used for furniture, and now for turning and brushes: HOTZAPFFEL, *Woods*, 8vo., London, 1843. 71.

**CHOCK**. The general name given to a very large wedge shaped piece of wood or metal, used as a filling-in piece in frames, shores, and other rough constructions.

**CHOCOLATE LEAD**. A pigment made by calcinating three parts of oxide of lead with one of oxide of copper. 23.

**CHOG**. The term commonly used in the west of England for a fillet; as "gutter boards, chogs", etc.

**CHOIR** (Lat. *chorus*; It. and Sp. *coro*; Fr. *chœur*; Ger. *chor*). That part of a church or adjacent buildings where the services are recited or chanted at the canonical hours. In England the word is used in a very restricted and arbitrary sense for the eastern limb of collegiate churches: the word CHANCEL being applied to parish churches, and *choir* to cathe-

drals. The derivation of the word is no doubt from the Greek *χορὸς*, though HONORIUS, *The Solitary*, i, c. 140, attempts to derive it from "corona" and also "concordia". ISIDORUS, lib. i, cap. 3, defines the word "that part of the church in which the clergy sit and sing." In early Christian churches the chorus was simply a portion of the church in front of the altar enclosed by a low wall or "podium". In this stood the ambo and the paschal candelabrum. At present, with but few exceptions, the chorus is entirely enclosed with a wall or peribolus, and the *cancelli* by which the altar was formerly separated from the chorus are now placed at its entrance, and kept carefully closed against the laity during the recital of the breviary services. The origin of these alterations it is difficult to trace; CARRANZA, *Summa Concilior.*, 84 b, attributes the institution of the *horæ* to pope Damasus I, 366-84; and as no sort of alteration was made in the plan of the Christian church for many ages afterward in Northern Europe (the basilica plan still, and always has, prevailed at Rome), it must be supposed that those services were chanted within the podium or enclosure, in sight of all the laity. In fact this is distinctly stated by DURANDUS, *Rationale*, i, 3, as the ancient practice, although it can be clearly gathered from his words that it was the exception in his time. He says, "in the primitive church the peribolus or wall which encloses the choir was not raised higher than a height convenient to lean on (usque ad appodiationem), so that the people seeing the clergy singing, should thence learn a good example. But in this period (before 1296, in which year he died) almost commonly a curtain (velum) is suspended, or a wall interposed, lest they mutually should see each other." The change probably took place about the time the monastic orders superseded the secular clergy in the greater part of their possessions and privileges. In several churches of Italy, however, the choirs are still enclosed in the primitive fashion, particularly at the duomo at Florence, where it is held immediately under the dome, and is surrounded by an octagon enclosure about 4 ft. high. AMBO; ANTICHOIR; APSE; BASILICA.

As has been stated under 'Chancel', considerable embarrassment has been caused to architects by an idea which has lately been taken up, that the laity, and more especially women, should *always* be excluded from the choir; and several extracts have been made from the Decretals to prove this idea, which would necessitate the building churches one-third at least of which must be useless. And as most choirs in England are enclosed by high stone screens, another anomaly has arisen, that the laity are all huddled into the choirs, so that one quarter of the cathedrals is only available. To go at length into the ritualistic argument would exceed these limits; but a few facts must not be overlooked. The ancient chorus was only a sort of large pew in front of the altar; and the *cancelli* then separated the altar from the chorus, and not the chorus from the nave. It was also the custom of the Eastern Church, like that of most oriental countries, as much as possible to separate the women from the men, both in private houses and public buildings; and latterly, with them, the altar was enclosed by high doors, which were carefully shut at the time of consecration, so that the dicta of the Greek fathers must be taken in connexion with their customs. The idea of excluding the laity during the celebration of the public services, masses, the visit to the sacrament (or public vespers), rosaries, etc., is wholly unknown abroad. The choirs (so called in England) are there open to all, and ever have been, both to men and to women.

What is here called a choir is not so called abroad, but it is more properly denominated the 'tribune'. The *coro* also is moveable, and is held sometimes in one part and sometimes in another. In Sta. Maria Novella at Florence, it is sometimes behind the great altar, and sometimes in the chapter house leading out of the Green cloister. At S. Peter's in Rome it is sometimes in the Clementine chapel, and sometimes in the sacristy. At S. John Lateran the *coro* was before the papal altar; now it is behind the high altar in summer, and in winter

in one of the side chapels to the left of the altar. At Sta. Maria Maggiore it was formerly in the second side chapel on the right of the nave or baptistery, but is now in the third chapel on the left, or capella Sforza. At S. Mark's at Venice, and many churches of Lombardic type, it is, like the ancient 'chorus', in front of the altar: but in most of the Northern churches it is at the back of the high altar, much in the position of our Lady chapels. The fact is, the place where the *coro* is held ceases to be so, or to be called so the moment the breviary or choral services are finished; the gates are then opened, the laity enter, and high or low masses, or any other *public* services, or private masses and prayers at private altars, go on just as if they had never been closed. That they were admitted in England in mediæval times, may be proved from two passages from BARCLAY's *Ship of Fools*, where he describes the fops of that day

"Clapping with their heels in church and in *queare*,  
So that good people cannot the service hear";

and again—

"And when our Lord is consecrate in form of bread,  
*Thireby* walks a knave, his bonet on his head."

In fact, the different parts of the churches abroad are used for whatever purposes they are most fitted in point of size and accommodation. A striking instance of this is found in the Jesuit churches, which have no choirs at all. This ecclesiastical body being exempt from the necessity of reciting the *horæ* or breviary services at every three hours during the day and night, the choir would be practically useless. These customs would at once explain the supposed contradiction in the third canon of the second Council of Tours, held in the time of pope Pelagius I. (555-560), where it is ordered the part within the *cancelli* should only be open to the "*choris psallentium clericorum*" (which it is to be supposed would be only while "*psallentes*" or singing from the breviaries); and in the next sentence it is ordained that the "*sanctum sanctorum*", the holiest place of all, should be open to the laity both for prayer and for communicating.

The choirs of English mediæval cathedrals were mostly enclosed with lofty and massive stone screens, and furnished, like CHANCELS, with *altars*, *piscina*, *sedilia*, *stalls*, etc. As the Church of England has resolved, after primitive custom, that the communion table, and that moveable, should be substituted for the altar of the Roman Catholic Church, there seems no reason why the services, according to the Rubric, may not take place, both in *churches* and *chancels*, as may be most convenient, and the anomalies referred to be avoided. In England the position and uses of the places have varied according to pleasure.

A. A.

CHOLULA (formerly CHUNULTECOL). A town in the state of La Puebla in Mexico. The houses, which are flat roofed and of one story in height, are separated by regular and spacious streets. It is still celebrated for the largest TEOCALLI in Mexico. This is composed of layers of earth and sun-dried bricks 177 ft. high, in four orientated stages of equal height, the lowest being 1440 ft. square; the summit was reached by means of a hundred and twenty steps. A road was (about 1806) cut through it, as shewn in pl. 7 and 8 of HUMBOLDT, *Atlas Pitt.*, fol., Paris, 1810, pp. 27-28, and NEBEL, *Voy. Pitt.*, fol., Paris, 1836, who mention the discovery of two skeletons in a stone-walled chamber, as proof that this, like other teocalli (two of which are not far distant), was intended as a sepulchre.

CHONEION (Gr. *χωνειον*). A term corresponding to PISCINA, used in the Greek Catholic church: ANNALES DE PHILOSOPHIE CHRÉTIENNE, 8vo., Paris, xix, 439.

CHOPPING BLOCK. The name given to any piece of timber, from 6 to 8 ins. square, set upon a couple of piers or more, about 30 ins. high, to serve as a bench upon which bricks are axed to any intended form.

23.

CHOQUIQUIRAO. An ancient city in Peru. LAVENDIN mentions these ruins as the antiquities most complete in that country; well built houses of hewn stone, form a principal



street descending by gradual steps, on the slope of a mountain which is everywhere covered by terraces making platforms for the houses, to a large square having on one side a palace, on the others a portico or triumphal monument. That facing the palace has a single opening, leading by stairs to the top of an isolated hill, surrounded by a wall, and called the *adoratorio del Sol*. The palace is formed, as the dwellings in all the ancient towns of Peru, of two distinct houses, each consisting of three long apartments, of which the middle one appears to have been the entrance hall. They are approached from two galleries, which extend the whole depth of the structure, one at each side. Their first and second stories are clearly marked; the beams of the ceilings still remain; the roofs were very considerably sloped, and rested on the party wall. The rooms are floored with large bricks of burnt clay, covered with a fine black varnish. In each room are niches, and holes at various heights seem to indicate that they were repositories formed of various ranges of boards. There is no trace of an internal staircase. To the right of this is another pile with three doorways, but with the partitions ruined; and still further a reservoir, a bath of stone flags, and a large hall. It is known that this place was abandoned about 1538, in consequence of the attack threatened by Francisco Pizarro. CIVIL ENGINEER *Journal*, 1851, xiv, 382.

**CHORAGIC MONUMENT.** The name given to a tablet, pedestal, column, or building, recording the name of a victor or victors (Gr. *χορηγός*; Lat. *choragus*) at the theatrical or musical contests in ATHENS. Such were that of Lysicrates, commonly called the Lantern of Demosthenes (335 B.C.), given in STUART and REVETT, *Antiquities*, fol., London, 1762, i, 27, of which there is a restoration, cast from moulds taken from the original, exhibited at Sydenham; that of Thrasylus and Thrasycles (318 B.C.), STUART, ii, 29, excavated in the rock on the south side of the Acropolis; and also the two isolated columns, higher up and behind it, which, from the triangular shape of their capitals, doubtless each carried the bronze tripod that formed the prize in such contests, and was customarily made one of the features of the public decoration of the city, if not deposited in some temple.

**CHORAGIUM** (Gr. *χορηγεῖον*). The Greek name for a portico or vestibule, behind the scena of the ancient theatre, which served as the dressing room of the chorus, JULIUS POLLUX, iv, 15; and as a shelter for the spectators if rain interrupted the performances, according to VITRUVIUS, v, 9, where *choragi* must be read instead of *choragia*.

**CHORIUM** (Gr. *χορίον*), see CHORUS.

**CHOROBATES.** A level recommended by VITRUVIUS, viii, 6, in preference to sights or water balances. It consisted of a rule about 20 ft. in length, with a leg square to it, and fixed by a diagonal strut at each end. Lines drawn on the struts shewed how much the string of a plumb bob suspended from the rule over each strut was out of the perpendicular. This level is surer in its result than the present long rule with a single bob: accuracy was further obtained by a trough 5 ft. long cut in the top of the rule, and containing water.

**CHORUS or CHORIUM.** The Latin term for a course in regular masonry or brickwork, also called 'ordo'; VITRUVIUS, ii, 3 and 8. **CHOIR.**

**CHORUS**, see SCHELLART (GERHARD VON).

**CHOUK or CHOWK.** The name given in Hindostan to a square or court: TOD, *Annals*, 4to., London, 1829, ii, 465, 489.

**CHOULTRY.** A name given by the English in Hindostan to buildings which are discriminated by the natives, but called by one name by Europeans. The meanest, properly termed *chauvadi*, but in the Tamul language *tanyundal* or water-shed, is a place where travellers may obtain shade and water during a short rest; this, which is merely a long shed open in front with a pent roof of tiles, is also used by the native officials for the place in which they transact business. Another structure properly called *mandapam*, built for the reception of images of

the Hindoo deities when carried in procession, may be used by travellers when not so occupied. Two examples at Conjeeveram each consist of a room closed on three sides, and divided by two rows of pillars that support a flat roof consisting of long stones: this room is surrounded by a colonnade or veranda, which is double before the open side of the hall.

The word choultry has been used (BUILDER *Journal*, 1850, viii, 15) for the CHAORI, as it has since been uniformly named. The true choultry is called properly *chaturam* or *chitteram*, and is built expressly as an inn for the accommodation of travellers: it is in fact a small caravanserai, consisting of a square court (sometimes there are more than one), formed by low tiled penthouse buildings: outside these courts is a colonnade or veranda, which forms a front or hall, as mean as the *chauvadi*, or as expensive as the *mandapam*. Everywhere within fifty miles of Madras such useful buildings are common, having been erected and endowed by the native merchants. BUCHANAN, *Travels in Mysore*, 4to., London, 1807, i, 10-15, iii, 465.

CHOWNE'S PATENT AIR-SYPHON VENTILATOR, was patented 28 December 1848. Several modes of its application are given in the ILLUSTRATED LONDON NEWS, 1849, xv, 227; BUILDER *Journal*, 1849, vii, 487, 577; ATHENEUM *Journal*, 1855, 928.

CHRISTIAN or KRISTIAN (ALEXANDER) of Innsbruck, in 1698 built the palace, founded upon a sketch by D. Martinelli, for the prince von Lichtenstein, in the Rossau at Vienna. 26. 68.

**CHRISTIAN ARCHITECTURE.** The following definitions of this term have been put forward:—Any style in which an edifice, used as a church, is built:—Any style originated amongst a people professedly Christian:—Any style practised under the sanction of the Roman Catholic priesthood; this is sometimes restricted 'between the years 500-1500':—Any of the Pointed styles used during the period 1200-1500 in nearly the whole of France, part of Germany, the Low Countries, part of Italy, England, and part of Spain, but rarely in comparison elsewhere. There is no apparent necessity for the use of this term.

**CHRISTIANIA.** The capital of the kingdom, and a seaport city, in the province of Aggerhuus in Norway. It is only remarkable for the fortress of Aggerhuus, and the church, given by ANDERSON, *Journal*, 12mo. London, 1853, p. 8. The new palace; the *storting*, or senate, house; the cathedral, built, together with the town, about 1624; the university new buildings; the theatre; the military academy and dépôt; the high Pointed episcopal palace, are the chief, but are plain buildings. The cathedral, dedicated to the Redeemer, was restored in 1846 by Chateaufauf; and a church is said to have been built from his designs by his pupil Hanno. The broad and straight streets are well paved, and lighted with gas; the houses, two stories high, are of plain brick and stone; those of timber have nearly disappeared. 14. 28. 50.

**CHRISTIANIA DEALS.** These, if white deals, *i. e.* spruce fir, are worth about one-sixth less than the yellow Christiania deals, *i. e.* Scotch fir. Until 1817 the first and second qualities were separated at the port of shipment; and of late years the mixed cargoes have not been assorted before sale in the yards of the importer, broker, or consignee, who sells them on an understanding of two-ninths being of the best quality. Christiania deals ought to be 9 ins. wide within the sap, but though some may have fully that width, many are only 8 ins. wide. The best are not entirely clear of knots, but these knots are bright and firmly united to the substance of the timber. The standard Christiania deal is now 12 ft. long, 9 ins. wide, and 3 ins. thick, and the standard yellow batten has the same dimensions by 7 ins. wide. The Christiania deals, at their best, have been taken as standard of perfection for deals; they are durable, fairly stiff, light, and though mellow, have a sufficient degree of hardness for internal work, as dados, skirtings, shutters, and doors; and if properly seasoned, both the white and the yellow deals retain the form given by the joiner,

however small the parts of the work may be, more than any other deals. White deals from Wekkerøe, averaging 19 ft. in length, are sometimes sold as Christiania deals, from closely resembling the least mellow and the hardest of them: next to the Christiania deals are those from Frederickstadt, Archangel, and Gefle. ABIES. BALTIC TIMBER. PINUS.

**CHRISTIANSAND.** A seaport city and capital of the province of the same name in Norway. The wide streets are made extremely long by large gardens which separate the timber built houses. The cathedral, a large cruciform white-washed building of grey stone, built, together with the town, in 1641; the government house, offices, and courts of law; the prison; the school; and the bank, are the only remarkable edifices. It is said that the stone for this church and for the palace at Christiania was obtained from Bergen: ANDERSON, *Journal*, 12mo., London, 1853. 14. 28. 50.

**CHRISTIE** (VERNER HOSEWINKEL), a Norwegian, born 1746, was made a *cancleleirath*, in reward for a design for the church, in imitation of an antique temple, built at Bergen. 68.

**CHRISTODOULOS** erected about 1469, at Constantinople, the mosque of Mahomed II, on the site of the church of the Apostles, which was originally erected at the expense of Theodora, the wife of Justinian, and contained the *heroon* or tombs of the emperors of the East. MILIZIA, *Lives*, 8vo., London, 1829, i, 196, calls this architect CRISTOBOLLO, and adding that he afterwards built eight schools and as many hospitals dependent on the mosque, states that the sultan, as a reward, gave him a street, which remained in the family of Cristobolo and was inhabited by the Christians; but the affair is related differently in a long story by EVLIYA, *Travels*, 4to., London, 1834, p. 68.

**CHRISTOPHORUS** (PETRUS), see CRISTOBAL (PEDRO).

**CHROMATE OF MERCURY.** A pigment which, although of a bright ochreous red colour while in a powdered state, has a bright orange ochre colour when ground, and gives very pure orange tints when combined with white. It changes to a deep russet colour when exposed for some time to the light, and becomes black under the action of impure air: it is ineligible for use in water. 9.

**CHROMATOBLEPSY** or colour blindness, and **CHROMATOPSUDOPSIS** or false vision of colour, formerly called DALTONISM, have been treated by WARTMANN in TAYLOR'S *Scientific Memoirs*, 1846, iv; and by WILSON, *Researches*, etc., Edinburgh, 1853. *ATHENÆUM Journal*, 1853, 418.

**CHROME GREEN, or NATIVE GREEN.** A pigment which derives its colouring matter from pure oxide of chromium; being free from lead it is not affected by the action of light or of impure air; it does not quarrel, when mixed, with other pigments, and dries quickly in oil; it is also used for water colours. This pigment is prepared of varying transparency or opacity; and of varying hues, more or less cool; which may be called fine, rather than brilliant, greens. It is obtained from a chromate of iron. 9.

**CHROME GREENS**, commonly so called, are pigments having chrome yellow as the principal colouring substance, being chromates of lead compounded with Prussian blue or other blue colours, constituting greens showy in appearance, like Brunswick green, but which are only suitable when the paint is often renewed, as they suffer from exposure to impure air, and from the absence of light. They mix with oil, but are insoluble in water. 9.

**CHROME ORANGE.** A pigment which, if well prepared, is of a beautiful orange colour, brighter than red or orange vermillion, but is inferior in durability and body to the latter: although it is one of the most durable and least exceptionable subchromates of lead, it is generally, but wrongly, described as a chromate of iron. When mixed with oil it suffers from the absence of light, and from the presence of impure air, and is not soluble in water. 9.

**CHROME YELLOW.** The general name given to several fine varieties of a yellow pigment, which are chiefly chromates

ARCH. PUB. SOL.

of lead. They lose their pure colour if deprived of light, or if long exposed to it, and even become black under the action of impure air: they are insoluble in water, but mix readily with oil. They produce serious changes upon other colours. 9.

**CHRYSIPPUS**, see VETTIUS (CHRYSIPPUS).

**CHRYSOCOLLA.** The name given by the ancients to a recent blue sediment of water standing in metallic veins, which was used as the base of a green colour made by the addition of woad (*lutum*) and sulphate of alumina; PLINY, *Hist. Nat.*, xxxiii, 26. The sediment of long existence, blue carbonate of copper was called *lutea*, and was of course harder. The green when manufactured was called *orobites*, and was either in powder or moist: both came from Cyprus. The best were Armenian, the second in quality were Macedonian, the largest supply was from Spain. The best was a bright grass-green in colour; there was an artificial one, properly called *viride appianum*, probably made of clay with a sulphate of copper (blue vitriol); DAVY, in *Phil. Trans.*, 1815, cv, 110.

**CHRYSOPHYLLUM ACUMINATUM** (*pitthogarkh*). A white tough wood of Gualpara, used for furniture. 71.

**CHRYSOPOLIS.** The ancient name of BESANÇON in France.

**CHUFFY or SHUFFY BRICK.** A brick made soft and friable through not having been completely dried before burning, or which has been spoilt by rain that has made its way into the clamp; BRICK (MANUFACTURE OF), p. 140. A. A.

**CHULUCANAS.** A ruined city situated on the great royal road of the Incas of Peru, at the top of the range of the Cordilleras. It consists of eight symmetrically arranged blocks or islands, each of twelve detached dwellings built of porphyry, and only having a single room: in the centre of the town is a square market-place, with four buildings to the sides, and as many at the corners: opposite, on the other side of the river, appears to be a sort of amphitheatre, consisting of six terraces, each faced with stone. HUMBOLDT, *Atlas Pitt.*, fol., Paris, 1810, p. 294, gives a plan, pl. 62.

**CHUNAM.** The name of a white cement extensively used in the East Indies from an early age. Two sorts are used. In the interior of the country it is prepared from a gravelly kind of limestone mixed with sand. Along the coast it consists of shell lime and sand mixed with *jaggree* (sugar) water. Another kind, used for plastering and taking a high polish, consists of shell lime (no sand), yolks of eggs, and *jaggree* beaten together with water in which the husks of the cocoa nuts have been steeped; HOLTZAPFEL, *Woods*, 8vo., Lond., 1843, p. 98.

STUART, *Dict.*, s. v. Stucco, states that *chunam* or *maltha* is composed of fifteen bushels of newly slacked lime, mixed with an equal quantity of pit sand, left to rest for three days. Mix twenty pounds of molasses with water; boil a peck of a kind of pea called *gramm*, with a peck of *mirabolans*, till the whole is reduced to a jelly. Incorporate the three ingredients intimately, and beat up to the consistence of a very fluid cement with as much of the lime and sand as may be necessary, after which add a small quantity of short tow, and it will be fit for use. When the workmen leave work, even for a short time, some of the gelatinous composition without the lime must be spread over the place whence the work is to be continued. The whites of four eggs and four ounces of buttermilk are to be added, at the time of use, to each half-bushel of the composition when intended to be used as a stucco.

The *Overseers' Vade Mecum*, by H. D. WALPOLE, published at Bombay 1841, states that "the choonam kunkur is abundant both in the Dekhun and Koukun. It occurs in concretions of various sizes and is found at uncertain depths, sometimes indiscriminately scattered over, at other times immediately or considerably below the soil." It is burnt in kilns, being kept at a white heat for ten to fifteen days. The best description of choonam should always be used where stability is an object of consideration. The following recipe is given for "the mixing of (choonam) mortar as customary in former days. It was obtained from a very old man in Poona, who was architect and

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builder of one of the Ex-Peishwa Bajee Rou's palaces, viz., slaked choonam (of the best description), good coarse grained sand, 40 seers of each; taug or hemp, 10 seers; goor, or coarse unrefined sugar, 8 seers; goond or gum, 7 seers; kaut or catechu, 6 seers; heerdai (the dried fruit of the 'Heerda' tree, 32 seers; to be well mixed in a choonam mill. It is to be remarked that unless the choonam be mixed with the due proportion of sand as before described, the result will be that as the mortar dries, instead of growing hard and adhesive in itself, it becomes hard and crumbling." "The quantity of certain of the articles need not be heeded; they are added with the view of rendering the mass impervious to water or moisture (except the hemp); as the cost of these sundries enhances that of mortar, they may be dispensed with or their proportion modified as follows: to 1 khunder (40 seers) of choonam and sand, *i. e.* 20 seers of each, allow, goor 1 seer; kaut 1 seer; taug 2 seers; goond 1 seer; heerdai 2 seers. These materials are termed *massala* or seasoning."

T. L. D.

CHUNDAOLI, see CHANDRAYATI.

CHUNHUHU. The name given to the site of some ruins about fifteen miles directly south of Uxmal in Yucatan, illustrated by STEPHENS, *Incidents, etc.*, 8vo., New York, 1843, ii, 130-5. They consist of a building, now 112 ft. long, on a substantial but low terrace; a projecting central doorway was the largest and most imposing that he had seen in the country; the attic of the façade consisted of banded shafts, between pairs of square blocks having sculptured sitting figures with uplifted arms touching the soffit of the upper cornice. On a lower terrace is a building with three plain doorways; its attic has frets, instead of figures, between the shafts: the fronts of all these buildings had been covered with plaster. A hill with ruins on the top intervenes between these and other ruins called Schoolhoke, twelve furlongs from them, consisting of a large mound, faced on all sides with stone; also a large stone structure; as well as an area having a range of ruined buildings on each side, one of which is 33 ft. long, with an attic having plain shafts and figures.

CHUNKUP. A term used, by RAFFLES, *History of Java*, 4to., London, 1817, ii, 36-40, for a place of burial, or a repository of the dead: it is frequently, as at Sentul, a highly decorated structure, about 36 ft. square, with one side appropriated to furnish the means of ascent from the west, while the others are perpendicular; on the top is a platform, or place for devotion, containing a reservoir of water, and at the bottom a subterranean cell approached from the south. The cell consists of three compartments, decreasing in size inwards.

CHUQUISACA (*i. e.* Choque chaka, bridge of gold), or LA PLATA. The capital, founded in 1529, of the state of Bolivia. The streets, regular, wide, and clean, are paved in the centre with large pebbles, but the footways are flagged. The houses, two stories in height, have each a courtyard with a small stream of good water. The cathedral, dedicated to S. Domingo, richly decorated inside, has a large dome that has or had four lofty towers, occupying one side of the principal square, which contains also the palace of the president of the republic, formerly belonging to the archbishop of Charcas. Of the twenty-seven churches, five of which are parochial, that of S. Miguel was built by the Jesuits. Only two monasteries and three convents exist, other similar buildings having been converted into the *seminario*, college, and like establishments. A theatre has been recently constructed. TEMPLE, *Travels*, 8vo., London, 1830, i, 396. D'ORBIGNY, *Description de Bolivia*, Paris, 1845, gives a view of the *plaza grande*. CASTELNAU, *Expedition*, 8vo., Paris, 1850, iii, 291.

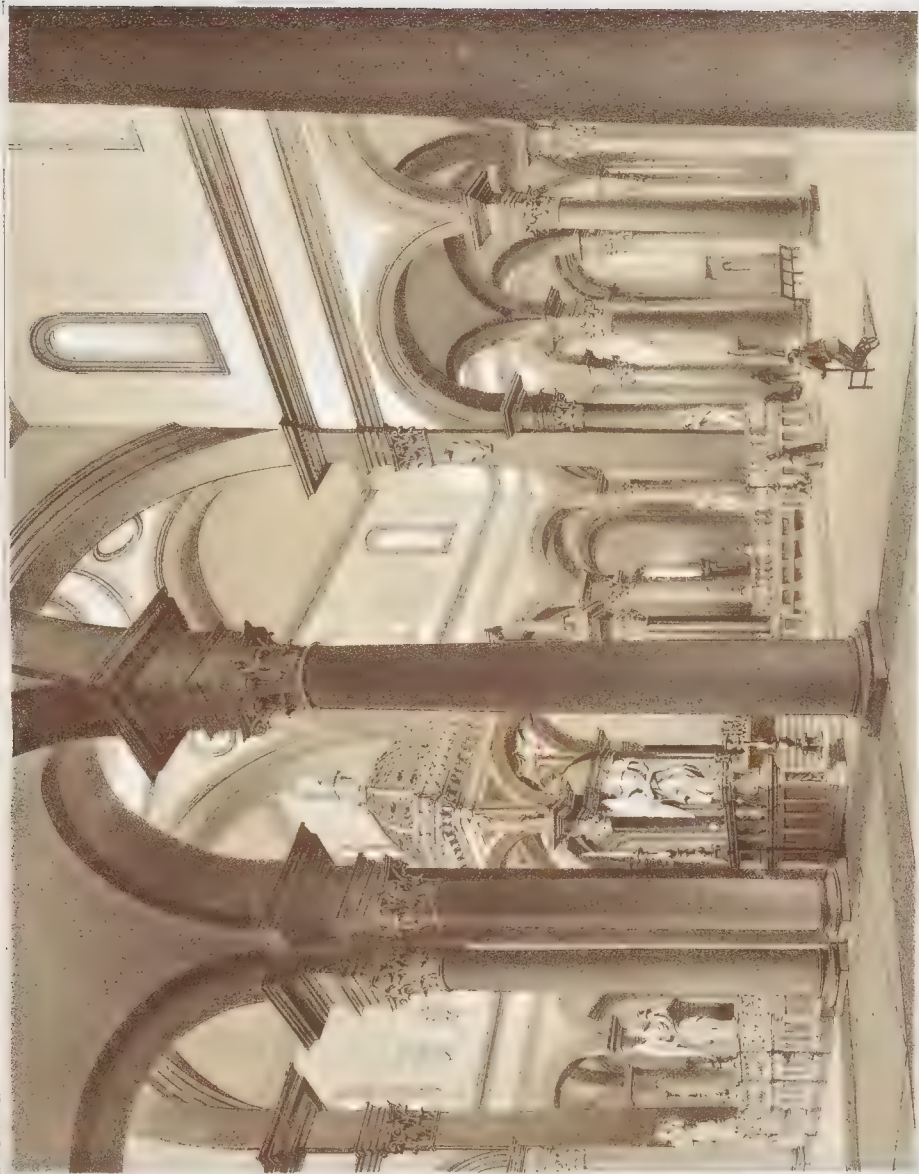
CHURCH (It. *chiesa*; Sp. *iglesia*; Fr. *église*, from the Greek *ἐκκλησία*, and the Latin *ecclesia*, an assembly or congregation; Ger. *kirche*, supposed to be from the Greek *κύριος* *oikos*, house of the Lord, to which the Scottish *kirk* and English *church* are also referred). The name given under two conditions to a building set apart for the purpose of divine worship,

by a public assembly of persons uniting in the profession of the Christian faith. It is indispensable that the building, or rather that the assemblage in that building, should have the right of having the sacraments there administered; and if any form of such profession is 'by law established' in any country, its adherents use the term, while the supporters of any other form have a lower title applied to their places of worship. In countries, however, where such forms are treated equally by the civil government, every such building assumes the title of church. The article CHAPEL details the extreme difficulty of distinguishing some chapels from churches; as well as notices of the cases in which the title of church remains, although circumstances have changed. CATHEDRAL. MINSTER.

Churches are divided by English writers into classes, such as *cathedral*, including pontifical, patriarchal, metropolitan, episcopal, etc.; *conventual*, and *collegiate*, where there is a chapter of secular clerks without a bishop (a chapter without a dean is hardly a chapter); a church in any of these classes is generally also distinguished as a mother church, in Italy the term *de plebe, della pieve*, is attached to a parochial mother church; *parochial rectory, parochial vicarage*, and *parochial curacy*, inclusive of churches formerly *mensal, chapels of ease* when augmented, and *district churches: parochial chapels* differ only in name from parochial churches. Some collegiate churches are in reality FREE CHAPELS, which is generally the case with those churches called DONATIVES. In Italy, oratories of fraternities, charitable institutions, and palaces are regarded, if consecrated under certain conditions, as public churches.

Although a church, if not prejudicial to ancient churches, may be built without license from the bishop, the law takes no notice of it as a church without his certificate of the consecration, so that practically the license is essential. The delivery of the license was signalized by the attendance of the bishop or his commissioners to erect a cross and set forth a cemetery, and then the founders might proceed with the building; but it was perhaps more usual for the bishop to lay the corner stone at the same time. The forms for the consecration of the cemetery and church have always been left to the discretion of the bishop. The freehold of a parish church, with its cemetery or churchyard, is in the parson or rector, who by the canon law is obliged, as is the case on the continent generally, to repair the church; under the common law in England, the parishioners are to keep the church (or rather the body of the church) and steeple in repair, but not any aisle, chapel, etc., to which any person claims by prescription to him or to his house, his reparation being the proof of such prescriptive right; and the parson or rector is to repair the chancel, and for such purpose may fell the trees in the churchyard: in London there is a custom to the contrary, for the parishioners repair the chancel as well as the church.

The structural requirements of a church, so far as pointed out by the English parliamentary enactments at present in force, would seem not to go beyond the provision of a nave, with perhaps a belfry, bell cot, bell gable, or bell tower; and those, who are considered to strain to the utmost the requirements of the canon law as existing in England, demand a structural chancel or choir, which did not originally exist in the simple churches of Ireland and Cornwall. The ECCLESIOLOGIST *Journal*, 1845, v, 135, contains an elaborate paper upon the division of a church into nave, chancel, and sacarium, being made either by features of construction, as the interposition of an arch, difference in height and breadth, etc., or by features of arrangement, as a screen, steps, difference in details, etc., and attempts to show that in all ages of the Church this threefold division has been made, either by construction or arrangement; sometimes all three have been marked in construction, sometimes all three left to be distinguished by arrangement; sometimes the chancel is marked by construction, the sacarium by arrangement; sometimes the converse of this last occurs. In most English churches the chancel alone is marked by con-

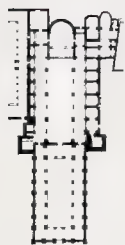
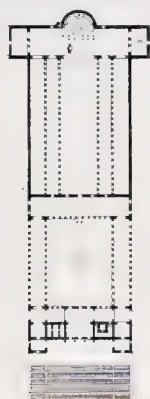


Temple of the Virgin Mary, Church of St. Peter and St. Paul, Rome, 1741.

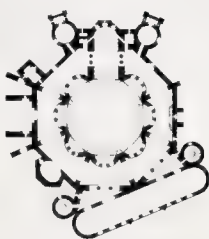




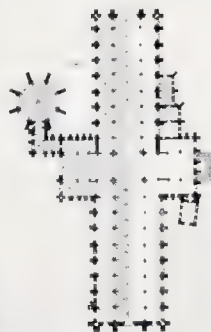
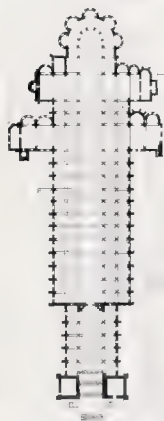
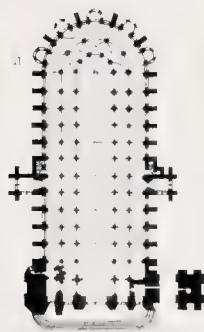
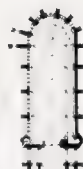
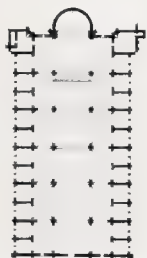
CHURCH



S. Ambrogio, MILAN,  
IX. XIII, Cent. 7)



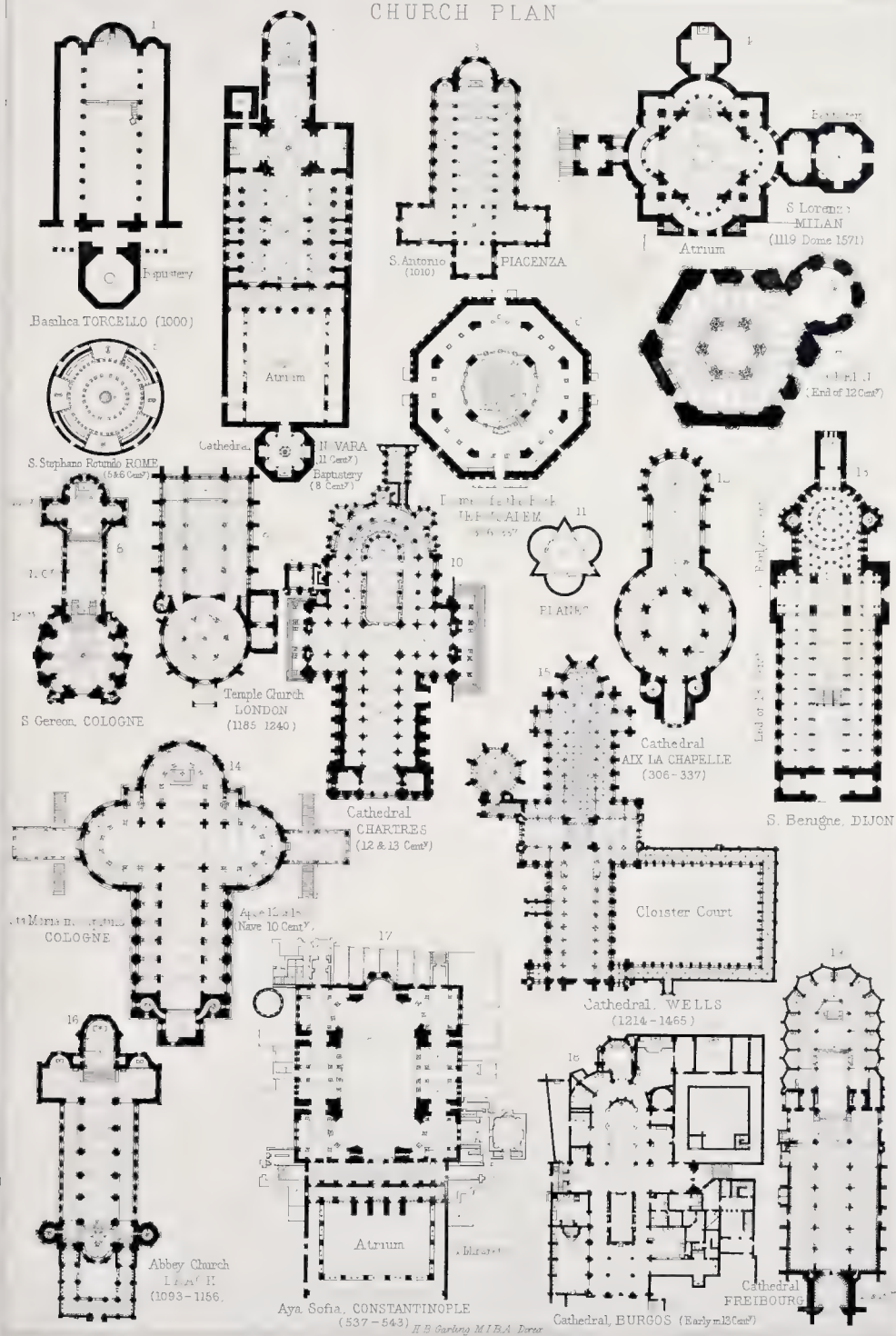
S. Vitale, RAVENNA







## CHURCH PLAN







struction; while in not a few, especially in the Third Pointed style, no distinction is made architecturally throughout the building: and this division is proposed as the reason why some churches have chancel aisles not continued to the east end.

Besides the apse, chancel, or choir in English churches, the addition occurred of transepts, single or double; of an aisle on one or each side of the nave, and sometimes to the chancel, but more rarely to the transept; of one or more chapels to each or all of these divisions; of a porch on the south side, and sometimes also on the north; of sacristies, robing rooms, and vestries; and of a spire or steeple. It would be tedious, and probably useless, to point out the titles of all the articles in which church architecture is mainly or incidentally treated; it must suffice to say that under the word GYNÆCEUM will be found notes on the division of the sexes in churches.

Passing the not unfrequent occurrence of two churches standing scarcely separated from each other, as at Westminster, and not unfrequently in the same churchyard, as at Antingham in Norfolk, it is just to note that there are cases of churches divided into two by a division north and south, as at Dunster in Somersetshire, divided in 1499, at Bridlington in Yorkshire, and at Wymondham in Norfolk; one portion being yielded as a parish church. Spanish cathedrals generally have a parish church called the *sagrario* opening into the cathedral, and there is often a *capilla real*, with separate priests and services. The church of S. Peter, at Wisbech in Suffolk, is an example of duplication on its length, having a nave on each side of an arched wall that also separates two chancels, etc. The double church of S. Luke near Libadia, is given in the *BAUZEITUNG Journal*, 1853, pl. 562-7, pp. 189-92. With regard to churches placed one above the other, mention should be made not only of that at Assisi, but of that erected 1151 at Schwarz-Rheindorff, and entirely Romanesque: the upper one, now restored, is surrounded by an open gallery or arcade of more than a hundred pillars: a plan is given by WEBB, *Sketches*, 8vo., London, 1853, p. 54. Besides the round towers, the rooms which exist in the old churches of Ireland between the stone double roofs, and the turrets entered from those rooms, examples still remain in Germany, France, and Spain, of churches fortified in themselves, and surrounded by moats or single, double, and even triple walls. Licenses were given (1373-4) in England for putting battlements to church towers. Mention has already been made, s. v. BORGUND, of the Norwegian timber churches: that at Greenstead in Essex, lately restored, and that at Newland in Worcestershire, still remain in England. A church or chapel with brick-nogged walls exists at Mattingley in Hampshire.

The ECCLESIOLOGIST *Journal*, 1847, vii, 44, gives a list of ecclesiastical buildings, dating between the Reformation and the Revolution; to which may be added Platt church in Kent said to be the only one of the Commonwealth, the porch dated 1663 to Boston church in Lincolnshire, and the church built 1666 at Hemington in Northamptonshire, in England; and Askeaton abbey (chiefly erected in the early part of the seventeenth century) in Ireland.

Among the many papers on church architecture are, FREEMAN, *On the Architectural Distinction between Cathedral and Parochial Churches*, given in the *BUILDER Journal*, 1852, x, 4 and 117; *Ecclesiastical Grouping, or Sites for Churches*, in the *ECCLESIOLOGIST Journal*, iv, 263; ANDERSON, *Local Peculiarities of Church Architecture*, read to the Lincolnshire Architectural Society 17 June 1851; FREEMAN, *Principles of Church Restoration*, London, 1846, reviewed in *ECCLES. Journal*, 1847, vii, 161; Church Building Society's *Instructions*, given in *BUILDER Journal*, iv, 231; WHEWELL, *Notes on German Churches*, 8vo., London, 1835; WILLIS, *Remarks*, 8vo., 1835; WEBB, *Continental Ecclesiology*, 8vo., 1848; BRANDON, *Parish Churches*, 8vo., 1848-51; NEALE and LE KEUX, *Collegiate and Parochial Churches in Great Britain*, 8vo., 1824; PETIT, *Architectural Studies*, 8vo., London, 1854; and *Remarks*, etc., 8vo., Oxford, 1846.

ARCH. PUB. SOC.

CHURNA, see DACHOPA.

CHURRIGUERA (DON JOSE), was born at Salamanca in Spain. On the death of Maria Louisa in 1689, he was successful in the competition design for her catafalque: it is given by DE VERA TASSIS, *Noticias*, Madrid, 1690. Although he had the title of *ayudante de trazador mayor*, 8 October 1690, and salary attached to it 30 July, 1696, on the death of Josef Caudi, his success made him too proud even to submit to the control of his principal ARDEMANS. Amongst his works were, at Madrid the portal to the church of S. Sebastian (destroyed); the custom house and depôt of tobacco, now occupied by the *real academia* de S. Fernando (but his portal has been replaced by another); the commencement of the church of S. Cayetano; and of the *capilla mayor* of that to S. Tomás (from the basement to the springing (*arranque*) of the arches), planned by Manuel de Torija; and, twenty miles from the city, for Don Juan de Goyeneche the small chateau (*palacio*), church to S. Francisco, and rest of the village of Nuevo Bastan, which has now sixty houses and is the property of the Conde de Saceda. The village is rather large and well laid out, having six streets, four squares, a town hall, and a prison. He died in 1725. 66.

CHURRIGUERA (DON GERONIMO and DON NICOLAS), sons of the above, erected the portal or frontispiece to the church of S. Tomás above named; the first died 6 February, 1731, and was buried publicly in the church of S. Sebastian at Madrid. The second was engaged after A. Garcia de Quiñones and Lara upon the *plaza mayor* at Salamanca, which was commenced in 1720, and finished under his successor G. Garcia de Quiñones in 1733. Two others of this family were Alberto, whose design for the façade of the cathedral at Valladolid is preserved in the vestry with those for the whole fabric by Juan de Herrera; and Matias, who died 30 June, 1734. 66.

CHURRIGUESQUE STYLE. (Sp. *stilo churriguresco*, *el churriguresmo*.) The architects above named, especially the father, exercised so important an influence on art in Spain, as to give their name to a style, for following which themselves and their imitators were called *gerigoncistas* or jargonists, *tramoyistas* or scene-painters, and *churrigueristas*. The plateresque, or BERRUGUETE, style was succeeded under Philip II by the strictly Italian classic manner adopted by Juan de Herrera, and called the *stilo HERRERESCO*, which in its turn succumbed to that of Churriguera, whose style was that which, if of French work, would be called *rococo*. According to FORD, *Handbook*, 12mo., London, 1847, xxxviii, and QUARTERLY REVIEW, cliv, "there is hardly a village in Spain whose parish church has escaped the harpy touch of this fatal epoch" of the "depraved invention," of the *stilo churriguresco* as exhibited by the sons above named, by the Garcias de Quiñones, by Tomás, and above all by Pedro de Ribera, by Tomás Gabilan, and by Tomás de Jauregui, who died 1768, but left disciples, who not only surpassed, if possible, Churriguera himself, but adopted the worst features of the works by Borromino and Dietterlin. The names of Galuci and Sani, (both Italians); Manuel Garcia, Antonio Marcelo Valenciano, Lucas and his son Josef Blanco, and Alonzo Roman, close the list of artists who practised in this style long after Philip V (1700-46) had introduced his countrymen, Carlier (died 1722), Marchand (died 1733), and Brachelieu (died 1744); as well as about 1736 the Italians Juvara, Sachetti, and Ravaglio Frascina, and Sermini, almost all of whom might be esteemed not only the principal, but the actual teachers of Ventura Rodriguez, who, in 1750, established in Spain the French academical Italian style.

CHYMOL, properly GEMELLE, also called GYMOW, and still as anciently in the eastern part of England GIMMER; that is, a hinge.

CHYNGIL. An old way of spelling shingle; SURTEES SOCIETY, *Finchale Priory*, 8vo., London, 1837, p. 37.

CHYRTON or CHRYTON, (WILLIAM DE), abbot of Evesham; rebuilt, 1319, the central tower of his church; and built the gate house with its chapel and apartments, and fortified



his monastery thence to the river with the existing stone wall. He died 1344. MAY, *History*, 8vo, Evesham, 1834.

CIAMPOLLI (AGOSTINO), born 1578 at Florence; was a pupil of Santi di Titi, and was employed not only in the church of S. Giovanni Laterano, but on that of S. Peter at Rome. 34.

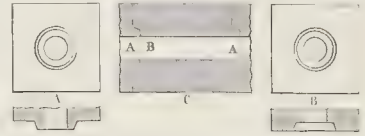
CIBBER (CAIUS GABRIEL) was born 1630 at Flensburg in Holstein, whence he came to England during the protectorate. His sculptural works are recorded in Dallaway's WALPOLE, *Anecdotes*, 8vo., London, 1828, iii, 152, v, 246. As architect he built 1696 for Christian V, king of Denmark, the Danish church in Welleclose-square, London; a view of the interior is engraved by Kip. He died about 1700. CIBBER, *Apology*, 8vo., London, 1740.

CIBORIUM (Gr. *κεράριον*). The old name still retained in Italy for a temple in miniature, sometimes enclosed, employed for the custody of the eucharist, in which case it is now called tabernacle, or for the exposition of the Eucharist, in which case it is now called the throne. This temple is a roofed structure placed over or just behind the altar in Greek and Roman Catholic churches. Whether the ciborium had originally a domical or elliptical vault, and was altogether of stone as suggested by the text of the CEREMONIAL EPISCOPOR., i, 12,—or had only a baldachin, a cloth stretched horizontally or in the shape of an umbrella,—for its roof, that with its prescribed curtains disappeared in the course of ages. Vaulted tombs in Auvergne, *confessionis* or altar-tombs in Italy, and bays of vaulting in England (SEVEREX) appear also to have had this name also loosely applied to them; and on the restoration of Roman art, the ciborium, but without curtains, was and still is erroneously called a BALDAQUIN. The ciborium was frequently termed *tegimen*, *umbraculum*, *peristerium*, etc.; *umbraculum* was also applied to the canopy or baldachin. It would appear that though every church, in Italy at least, can have a ciborium, the canopy or real baldachin, whether of woven or solid materials, is, like its diminutive the ombrellone, a mark of rank: and the right to its use has been confined, except under papal grants, chiefly 1629-33, to those churches which possess the mitre and the crosier. At Milan may be seen in the B. V. del Carmine, and S. Sebastiano, a ciborium standing under a canopy (baldachin) suspended from the roof; in the duomo, S. Stefano, S. Vittore, and Sta. Maria presso S. Celso, there is between the canopy and the ciborium a crown from which an *aulcum*, *peripetasma*, or *velum* depends, to replace the curtains of the ciborium. At Rome exist two fine ciboria in Sta. Maria Maggiore; a little known example by Bernini, 1633, in S. Peters; one in S. Giorgio in Velabro, considered to date from the seventh century, and to be the finest in existence: this and one somewhat similar in S. Clemente, with the Gothic one of Sta. Maria in Cosmedin, are given by GAILHABAUD, *Monumens*, ii, 61-63. One in the duomo at Forlì, and another in the chapel of the SS. Sacramento, in S. Vitale at Ravenna are attributed to M. A. Buonarroti. BINGHAM, *Origines*, 8vo., London, 1848, ii, 444. DUCANGE, *Gloss*, s. v. BELLENGHI, *Dissertazione*, Rome, 1836. PUGIN, *Glossary*, 4to., London, 1844, s. v. ANASTASIUS, *liber pontificalis*. MAZZOCCHI, *de cathed. eccles. Neapol.*; ROCK, *Hierurgia*, 8vo., London, 1851. 25 40.

CIBORIUM being also applied to a tabernacle, a closet, a closed niche, the throne for the monstration, a vase, and a pyx, has caused much confusion in descriptions.

CIBYRA afterwards called CESAREA. An ancient city of Phrygia, now represented by some Greco-Roman ruins on a hill half-a-mile from Horzoo in Anadolia. These remains consist of a gymnasium, formerly a theatre, 266 ft. in diameter with thirty-six visible rows of seats in fine preservation, one row consisting of stone chairs with backs; some large buildings, of the Doric and Corinthian orders, supposed to have been temples; an odeum 175 ft. wide with the front nearly entire, and thirteen visible rows of seats; a Doric archway to a road lined with tombs; and a remarkable stadium 650 ft. long and 80 ft. wide in the area, with twenty-one ranges of seats on one side and

end, and indications of an arcade along the upper row: plans are given by SPRATT, *Travels in Lycia*, 8vo., London, 1847, who observes that many fragments in this, the Birmingham of Asia Minor, are carved in imitation of metal work. Mr. Edward Falkener found tubes in masonry composed of rectangular



blocks varying from 2 ft. to 2 ft. 6 ins. on the sides of their face, and from 18 to 30 ins. long; the internal diameter was 7 ins., and a nozzle 2 ins. thick projected 2½ ins.

CICCA or CECCA, see ANGIOLO (FRANCESCO D').

CICCIONE (ANDREA), a pupil of the second Masaccio, erected at Naples the great portal of the church of S. Lorenzo; the chapel (altered 1736) of Sta. Maria dell' Assunta or de' Pignatelli, opposite the Seggio di Nido; enlarged after 1384 the church of Sta. Croce, near that of S. Agostino; erected before 1412 the church (burnt 1647) of Sta. Marta, opposite the campanile of Sta. Chiara; executed 1399-1414 the marble decorations to that of Giovanna Carbonari; and a palazzo in the same street, or according to others the palazzo Casoli, in the piazza di S. Giovanni Maggiore; erected 1411 the monastery, now public offices, and church (rebuilt 1581, and modernized 1613) of Monte Oliveto afterwards called Sta. Anna de' Lombardi, and now S. Carlo Borromeo; probably after 1432 the palazzo (much altered in the following century) of Bartolomeo Riccio in the strada Forcella, afterwards Ercolense, near S. Biagio de' Librari; and the third cloister of an Ionic order to the monastery of SS. Severino e Sossio, near the Seggio di Nido; besides many other important works, inclusive of the tombs of Giosué Caracciolo (1403), formerly in the nave, but removed to one of the chapels of the cathedral; queen Margaret (1412) at Salerno; king Ladislaus (1414, CICOGNARA, *Storia*, fol., Venice, 1823, ii, 53-54), and Gianni Caraccioli (1432), both in the church of S. Giovanni a Carbonari; and Francesco Caraccioli (1454). He died about 1455 according to the usual accounts, but before 1440 according to TICCOZZI, s. v. The chapel of S. Giovanni Evangelista, built of piperno stone, by the poet Pontano, near the Pietra Santa at Naples, was erected 1492 from the design of Ciccione. 36.

CICILIANO, see SICILIANO (ANGELO).

CIELING since about 1736 has been written CEILING.

CIELURE formerly SEELING, see CEILING and CILIERIE.

CIGOLI. The name given to CARDI (FRA LODOVICO).

CILIERIE, CILERY, or SILERIE. This word means the drapery wrought on the heads of pillars or posts, and made as cloth or leaves turning divers ways, according to MINSHEU, *Diet.*, fol., London, 1617, s. v., and the BUILDERS' DICTIONARY, 8vo., London, 1734. *Cilering* or *Silouring* occurs in the accounts printed by the SURTEES SOCIETY, *Finchale Priory*, 8vo., London, 1837, p. 297, and is explained to be ornamenting in general; because the name of the person employed was Kerwor or Carver; yet on p. 446, it is allowed that *silour* is apparently the valance of a bed. CIELING and CIELURE.

CILL. A recent mode of spelling SILL: GROUNDSTALL.

CIMA, see CYMA.

CIMABUE, called also Gualtieri (Giovanni), born 1240, was appointed 1298, together with Arnolfo di Cambio, to assist in building the cathedral of Sta. Maria del Fiore at Florence. He died in 1300 according to VASARI; but in or soon after 1301, as shown by CIAMPI; BALDINUCCI, *Notizie*, 8vo., Florence, 1845, i, 31.

CIMBIA. A term formerly used for a band or ring placed or worked round the shaft of a column, as if to give it strength or support. ANNULATED COLUMN; BANDED COLUMN. 19.

**CIMMERIAN BUILDINGS.** "There are still to be found in Scythia, walls and bridges which are called Cimmerian"; HERODOTUS, *History*, iv, 12, who shows that in his time this people no longer existed. 23.

**CINCINNATI.** A city with extensive suburbs, and quarries of limestone, in the county of Hamilton and state of Ohio, in the United States of North America. The title of "queen-city of the West" has been fairly earned. The 'levee' or stone river-side landing quay is 1000 ft. in length; the Roman Catholic church dedicated to S. Peter, and cathedral since 1821, is 200 ft. long, 180 ft. wide, and 60 ft. high, "having a roof of iron plates with the seams coated with a composition of coal tar and sand, which resists the wet very well"; over a ceiling of rich stucco work executed by a townsman, and resting on eighteen fluted Corinthian columns 35 ft. high, of freestone. About fifty-six churches and chapels belonging to various denominations; two synagogues; five or six large educational establishments; the Ohio medical college; the observatory; two museums; the lunatic asylum; the court house; the masonic hall, partly occupied by the post-office; Cincinnati college, containing the mercantile exchange and the mercantile library association, its exchange and reading room is 59 ft. long and 45 ft. wide, the building being 140 ft. long and 100 ft. deep; the Odd Fellows' hall, with a concert room 62 ft. long and 46 ft. wide occupying the whole of the second story (the two last named structures date about 1850); the mechanics' institute; the Apollo, and the Melodeon buildings; the theatre; two banks; three or four large hotels; many costly and rather handsome stores, comprise the chief buildings. Twenty slaughter-houses are so complete, that it is said that pigs are sent up one incline alive, and down another as barrelled pork. A plan of the city is given by WILLIAMS, *Handbook*, 8vo., New York, 1853. 96.

**CINCTURE** (It. *colarino*, *collarino*; Sp. *colarino* at top, *listelo* at bottom; Fr. *ceinture*). The fillet, listel, or square which receives the apophyte at the extremities of the shaft of a column, pilaster, etc. It is supposed to represent a ferule, girth, or hoop of metal, anciently put in such places to prevent the fissure of wooden pillars. The term has also been applied to the rings and bands applied to columns, piers, architraves, and other dressings to openings. **ANNULATED COLUMN**; **ASTRAGAL**; **BANDED COLUMN**; **COLLARINO**. 5. 6. 25.

**CINDER.** In the process of manufacturing iron from the ore, or *mine*, as the workmen call it, two descriptions of waste materials are produced, to which the name of cinder has been indiscriminately applied; thus in the smelting, or that part of the process connected with the conversion of the ore into pig iron, the clay and limestone which usually accompany that mineral, either together or separately, are made to combine, and form a species of glass or slag, hitherto of only local value, and carried at a great expense to the cinder heap; and also during the refining of the pig iron into bar, a considerable quantity of impurity is expelled by the action of the tilt hammer and of the rollers, to which properly the name of 'cinder' applies. **SLAG** consists principally of a silicate of lime and alumina, with a very small proportion of iron; whilst the cinder, from the refinery, often contains as much as between 60 and 70 per cent. of the oxide of iron. G. R. B.

**CINDER IRON.** Some years since a patent was taken out by the proprietors of one of the Welsh iron works for the purpose of converting the refinery cinder into mercantile iron, by remelting it together with the proportions of limestone or clay requisite to bring the composition of the load as nearly as possible to that of the original *mine*. The cinder itself whilst in the furnace, in fact, previously to the introduction of this process, had been found to run in so irregular and extraordinary a manner as to clog the tywers, and to deteriorate the quality of the iron. At first it was believed that the change thus proposed to be made in the character of the load, would obviate the practical difficulty to which alone attention was directed:

but it has been discovered that cinders, when used in any large proportions, always exercise a prejudicial influence upon the character of the iron into which they enter, and that they are especially objectionable in the manufacture of foundry iron. The pig produced by a large mixture of cinder is of a dull colour, rough and uneven upon the surface, porous in its internal structure, and very irregular in its powers of resistance. The refinery pig, which contains much cinder, is lighter in weight than ordinary metal, and the quality of the bars is always inferior to that obtained from the natural mine: they are usually and distinctly "hot short", or are unable to support welding heat: whilst they are also very frequently "cold short", or break easily under strains applied to them when cold. The use of cinder iron has so materially deteriorated the quality of English, Welsh, and Scotch bar iron, that unless it be for the very commonest purposes, the superior marks must be employed at the present day. The ordinary bar iron now made will neither admit of being welded, drawn, nor punched; and the plate iron usually made is far too often "hot short", at a white heat, to be trusted in delicate works. G. R. B.

**CINERARIUM.** A term applied by some French and Italian antiquaries to such a sepulchral edifice as the **COLUMBARIUM**: but it was probably used by the ancients for the urn to contain ashes, as *ossuarius* was for the receptacle of the bones. 25. 40.

**CINGOLI** (the Latin **CINGULUM**). A city in the legation of Macerata in the Papal States. The aqueduct of Hadrian is still visible. The cathedral, dedicated to Sta. Maria Assunta, was completed and delivered to the chapter 22 May 1660; there is no other parish church, but the priory of S. Esperanzio has a collegiate church in a Pointed style: the only other important establishments are four monasteries, as many convents, and a *ginnasio* in the former Filippine buildings. **AVICENNA**, *Memorie*, 4to., Jesi, 1644; **FANCIULLI**, *Osservazioni*, Osimo, 1769; **COLUCCI**, *Antichità Picene*, fol., Fermo, 1792, iii. 96.

**CINISELLO** (**RIDOLFO DA**) is mentioned in the list of architects to the cathedral at Milan from 10 January 1395 till 14 September 1399; and by **GIULINI**, *Memorie*, 4to., Milan, 1760, xi, 454, as one of the persons consulted on the designs submitted by Ulrich von Fissengen of Ulm for the cathedral. 27.

**CINNABAR** or **SINOPER** (It. *cinabro*; Sp. *cinibrio*; Fr. *cinabre*; Ger. *zinnober*). A name formerly given to two sorts of pigments. The *κιννάβαρι* of the Greeks, described by **PLINY**, *H. N.*, xxxiii, 38, as a mixture of the blood of the dragon and elephant (and not *milton*, i. e. red ochre, nor *minium*, i. e. red oxide of lead), is supposed to have been dragons' blood procured in Hindostan as at present from the palm called *calamus*, the rattan cane. The other in a natural state is a striated red coloured ore of quicksilver, the *anthraz* of **VITRUVIUS**, also called cinnabar in flowers, native red vermillion, or native red sulphuret of mercury; and is chiefly found at Almaden in Spain, but of inferior quality as to colour to that procured in China: the artificial is called factitious cinnabar, and red bisulphuret of mercury: both may be ground and levigated, but the first only is vermillion; the second is sometimes so called, but is in fact the Dutch or German cinnabar (second only to vermillion), and the French cinnabar (slightly inferior to them), which are pigments of a vivid red colour, that dry very slowly, and are subject to turn black, as they usually contain 5 per cent. or more of lead. 6. 14.

**CINQUE CENTO STYLE.** A style thus denominated from the years 1500, during which it was prevalent in Italy. The "cinque cento" may be considered as the most graceful and noble form of that school known as the **RENAISSANCE** and **REVIVAL**, in which art was raised to a high point of excellence. In considering the causes which led to the abandonment of the Gothic style, in Italy, at a period when in the north of Europe it had attained its full powers, it must be remembered that the remains of ancient art, abundant in the country, had been for three centuries objects of admiration and



study. A strong classical feeling is apparent in the foliage with which Cimabue (1240-1302) adorned the vaulting of the upper church at Assisi: the works of Nicolo Pisano (1206-78) are still more visibly tinged with such reminiscences; and notwithstanding the leaning displayed by Giotto (1273-1336), Orgagna (1316-89), and others of the TRECENTISTI towards Gothic, before the fourteenth century had quite closed the men were already at work who were destined to establish another dynasty in art.

Among the earliest was Jacopo della Quercia (1374-1438), who designed the fountain at Sienna, and is especially mentioned by VASARI as one by whom "a near approach was made to nature herself." Amongst the most renowned of the QUATTROCENTISTI may be named Lorenzo Ghiberti (1381-1455), the author of the wonderful gates of the baptistery at Florence; Donatello (1386-1468); and Luca della Robbia (1400-1481); whilst in architecture Brunellesco (1377-1446) and Alberti (1404-72) are the two earliest and most characteristic exponents of their style. Alberti was the first to render service to modern architecture, by publishing *De Re Edificatoria*; and the study of the ancient principles of architecture received another powerful impulse in the *Hypnerotomachia* of Francesco Colonna. But up to a late period in the fifteenth century the lingering influences of the "old style" may still be traced; and it was reserved for the succeeding race of artists to emancipate art from such anomalies as are visible in some of the early Renaissance works in Italy. In Florence, round headed windows, divided by small columns and arches into couplets almost Byzantine in effect, are found with bold and well proportioned cornices of purely classical detail, giving that uncertain character of style which is peculiar to the Florentine school; this occurs in the Strozzi palace as late as 1509. The same hesitation is visible in the façade of the Certosa at Pavia, about 1473; and still more curiously in the church of San Bernardino at Perugia, by Agostino della Robbia (1461), where the spiral columns of the thirteenth century are mingled with the arabesques and classical detail of the Renaissance. The same may be observed in the paintings; classic forms and pure arabesque being frequently portrayed, mixed with the pointed arches of a debased impoverished Gothic. All this, and other matter that might be cited, conveys the impression of men feeling their way, but the execution of the work is faultless; fruit, flowers, and other natural objects, are rendered both in bronze and marble with a delicacy and crispness rivalling the antique. The artists of this later period excelled in sculpture, and the most prominent of them are Benedetto da Maiano (1442-98), A. Verrocchio (1432-1488), and Alessandro Leopardi (1450-1510).

Pure cinque cento may be considered to date as a fully developed style from about this period; sculptors, painters, and architects—Bramante (1444-1514), at the Sta. Casa di Loreto, and Andrea Sansovino (1460-1539), amongst the first in point of time—improving and refining upon the works of their predecessors, and steadily rejecting all that was incompatible with, or contrary to, the spirit of antique art. Bramante was the founder of the Roman school, and it is remarkable that his Roman works, such as Sta. Maria della Pace (1504), the Cancelleria, the palazzo Giraud, and the Vatican Belvedere, though full of beauty, are deficient in that boldness which characterizes his earlier productions in Milan. The exterior of the apse of Sta. Maria delle Grazie at that city (*Illustrations*, *PLATE*, pl. 106) is one of his best designs, and is a pure and well composed example of the style at that period. One of the richest and most elaborate early examples of this style is the church of Sta. Maria dei Miracoli at Venice, carried out, like Dante's monument at Ravenna, by Pietro Lombardo in 1482. His sons Tullio and Antonio, and others of the same family, have filled Venice with monuments of their skill, as S. Zaccaria, and the scuole di S. Marco and di S. Rocco. But the style was raised to the highest pitch of splendour through the addition of colour to the purer beauty of form. Hitherto

the sculptor and architect had gone hand in hand, but now colour was brought to decorate large spaces of wall and ceiling with all the richness that fancy could suggest. The discovery of paintings in the golden house of Nero is generally considered to have been the means of turning the attention of Raffaele to this means of decoration: be that as it may, the works of Raffaele and his school form a marked era in the history of art. The most remarkable works of this school in painting are the loggie of the Vatican, the latter executed chiefly by Giulio (Pippi) Romano, del Colle, Penni, and da Udine; the villa Madama, the ducal palace, and the palazzo del Lé at Mantua, all by Giulio Romano; the Certosa at Pavia, and numerous palaces at Rome and elsewhere. Of these it is sufficient to say that Pippi displayed the greatest amount of classic taste, the richest inventive faculty, and the most harmonious system of colouring; all the parts being so well relieved one from the other, and the masses of colour so well balanced, that no one part is offensive or fatiguing to the eye.

The *stilo-cinquecento* is purely of Italian origin and growth, and certainly sprang from a deep and true love for nature, combined with a fervent admiration of and reverence for the antique: and it may be noted that in no instance did either the one or the other result in that servile copyism which has been the bane of later ages. The works of the ancients were earnestly studied, and their proportions and details were measured and compared, but only to be adapted with variety and originality of treatment to the necessities and tastes of the times. Yet whilst certain portions were freely employed from the antique, the ornament of the school was chiefly derived from nature; foliage, festoons of fruit and flowers, birds, and animals, were treated with such freedom and grace, that the charm and interest of the group are ever attractive; objects from still life, armour, musical instruments, naval emblems, agricultural implements, and a variety of such things, are seized upon and ingeniously applied as decorative adjuncts, with marvellous boldness and skill of application, as at the scala dei Giganti at Venice by Briosco (1485-1500), and the tomb of Galcazzo Visconti at Pavia. Indeed, in monumental sculpture the full powers of the artists shone forth; the tombs in Sta. Maria del Popolo at Rome, and others at Brescia, Venice, and Milan, are perfect examples of the beauties of the style.

Although in Italy the writers and artists of the whole of the sixteenth century are called cinquecentisti, because their works are dated 1500 to 1599, yet cinque cento architecture, after the first half of the sixteenth century, sank into the debased style of the Renaissance properly so called, and at last yielded entirely to the growing taste for *rococo* which characterized the end of the seventeenth century.

J. M. L.

CINQUE FOIL, see FOIL; FOLIATION; LOBE; ROSE.

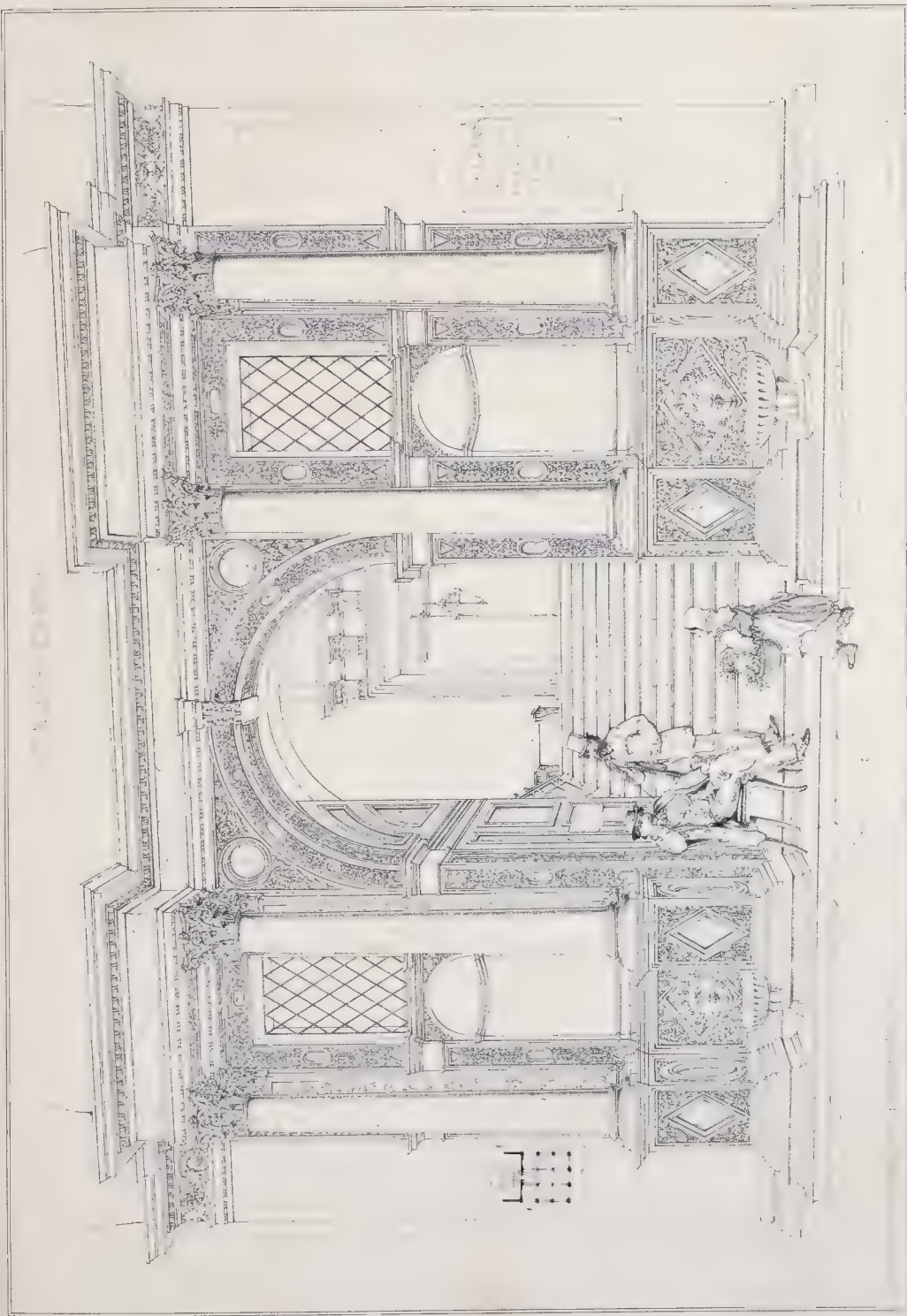
CINTORA (DON LUCAS), born 1732 at Fitoria in Navarre, went 1746 to an architect's office at Bayonne, acted as clerk of the works to the chapel of N. S. del Pilar at Saragoza, and to the great *fabrica de tabaco* at Seville, became *academico de mérito* 5 May 1776, in the Academy of S. Carlo at Valencia, architect to the *alcázares reales*, and director of the school of mathematics at Seville. In that city he altered the *colegio de las Beas* for the accommodation of the Inquisition; remodeled the mansion of the marques de Medina, and the buildings which had been the *hospital real*; and erected the spacious arcaded galleries and their bookcases for the *archivo-general de Indias*, forming an upper story to the *casa lonja* or exchange. He published, 1777, criticisms on the works at the cathedral; and 1786, a vindication of his works and alterations at the *casa lonja*, designed by Juan Herrera. He died in 1800.

66.

CIOFFREDO, see GIOFFREDO (MARIO).

28.

CIONE (ANDREA DI), called Archagnuolo, Arcagno, Lo'rchagnia, Orcagna, Orhangnia, Orgagna, etc., (RUMOHRE, *Italienische Forschungen*, 8vo., Berlin, 1827, ii, 88-113, who refutes BALDINUCCI, *Notizie*, 8vo., Florence, 1845, s. n.), is stated in the *Handbook for Italy* to have been about 1341 the









St. Mary's Church, St. Mary's, R.M.F. 1 June 1914.





architect of the Certosa in the Val d'Ema near Florence. Among the plans submitted 1355 (the *Handbook* states 1375) for the enlargement of the piazza de' Signori, now called del Granduca, at Florence, with porticos, a gallery, and a mint, that by Andrea was chosen, and the existing three-arched loggia de' Lanzi, formerly called de' Signori, was immediately commenced: NICCOLINI, *Elogio d'Orgagna*, supposes that the work was completed by Andrea's brother Bernardo according to the original design. BALDINUCCI notices the existence of a drawing by Andrea for the tabernacle to the picture of the Virgin in the lowest story of the granary, afterwards made a record office, called Orto San Michele or Orsanmichele, in the same city. This shrine, commenced after 1348 and finished 1359 according to the inscription upon it, has been illustrated by GAILHABAUD, *Monumens*, etc., 117, and to a large scale by MASSELLI, *Il Tabernacolo*, fol., Florence, 1851. It is uncertain whether the conversion of this lowest story, originally an open arcaded hall, into an enclosed chapel, was the work of this or of a somewhat earlier master. MOLINI, *La Metropolitana*, 4to., Florence, 1890, names Andrea as architect to the cathedral church of Sta. Maria del Fiore after Taddeo Gaddi, who died in or after 1366, and next mentions Filippo di Lorenzo as named with that title in 1384 and 1396: but RUMOR, ii, 113-116, 160-163, showing that Francesco Talenti was called *capomaestro* 1359, and was apparently succeeded in that year by Alberto Arnoldi, who is again mentioned in 1364, proves that Andrea was at all events one of the committee that 3 July 1357 investigated the objections urged by Benzi Cioni to the proposed proceedings at the church; that he was one of the artists present 5 July at the ceremony of laying the first stone of the nave-pillar nearest to the campanile; and that there was subsequently a great contest between the then *capomaestro*, F. Talenti, and Andrea on the design of this pillar. In 1363 Andrea and three others advised that in the nave *oculi* or circular windows should be adopted instead of *fenestre*, and that the cornice carrying a passage should be above the springers of the vaulting. Andrea died, according to VASARI, aged sixty years, in 1389; but BONAINI, *Memorie*, 8vo., Pisa, 1846, p. 105, shows that his death occurred before 18 January 1376.

With some confusion of dates, VASARI mentions another brother, Jacopo di Cione, as having been occasionally employed in architecture, for instance in the erection of the torre della porta a S. Piero in Gattolino, now called the porta Romana, at Florence. 68.

**CIPOLLINO MARBLE.** The modern Italian name of a whitish marble with greenish veins or bands, which is so called because, owing to the frequent layers of talc occurring in it, the marble "si divide à somiglianza della cipolla". These veins render the marble difficult to work, and easily affected by the atmosphere. This is one of the two marbles supposed to have been termed by the ancients Phrygian, and CARYSTIAN or CARYSTIAN, from the town now called Karystos in Eubœa, near which the government of Greece is endeavouring to open the old quarries. The monolithic shafts, 38 ft. high, of a Corinthian order, at the temple to Antoninus and Faustina in Rome, and four 13 ft. high from the baldaquin of S. Germain des Prés, now in the Louvre, are the most remarkable specimens. Bright (pale) green on a yellow ground (this is from Erbalonga in Corsica), and black on a white ground, sometimes yellowish, are the descriptions of cipollino given in the *BUILDER Journal*, 1852, x, 379. About 1844 it had recently been employed in veneers for a sort of mosaic work. The present supply of *cipollinaccio* from the valley of S. Maurice (Hautes Alpes), la Tuile (Mont Blanc), and several parts of Savoy and Piedmont, is a white marble with greyish or greenish spots and bands. *Cipollazzo* is white streaked with violet. *Cardiglio* is a grey variety of cipollino, said to be a Sicilian marble. Statuary cipollino, like the Pentelican, has narrow veins slightly tinted with green, and is said to weigh 189 lbs. per cubic foot. *Cipollaccio* is a bright yellowish green marble with large and small

square spots generally all black but sometimes with lesser white ones. BRARD, *Mineralogie*, 8vo., Paris, 1821, ii, 287, 304, 339, 348.

**CIPPPIO.** A calcareous stone obtained from the banks of the Adda, and usually employed at Milan as in the churches of S. Lorenzo Maggiore, S. Sebastiano, and S. Stefano. It is yellowish in colour, easily worked, and hardened by exposure to the air; BRARD, *Mineralogie*, 8vo., Paris, 1821, ii, 25.

**CIPPUS.** The name given to a small low pedestal, sometimes round, but generally rectangular, frequently without a base or a capital, used by the ancients for various memorial purposes, such as milliary stones, direction posts, and boundary stones. HERME; TERMINUS. The form and ornaments of the latter, when intended to mark the extent of a public or private burial-ground, have often caused them to be taken for altars: they were indeed sometimes consecrated, and had the top hollowed like that of an altar; but the inscription, when there is one, should decide this point: several in the British Museum can only be regarded as grave stones or funeral memorials of individuals. DUCANGE, *Gloss.*, uses the word for the keep, or rather prison, of a castle. 6. 17. 19. 25.

**CIPRIANI** (il cavaliere SEBASTIANO) of Norcia, a pupil of Carlo Fontana, designed the palazzo Antonelli at Aquila, after the earthquake of 1703; and was probably the same person as Sebastiano Cipriani, who engraved the catafalque of cardinal Bolognetti, built from a design by Maratti the great chapel of the church of Sta. Maria degli Angeli at Rome, and erected the catafalque for the exequies of John III (Sobieski) of Poland (1696), engraved by Bartoli. 12. 68.

**CIRAGE.** The name given to a monochrome or CAMAIEU, when the colour employed is that of yellow wax. 5.

**CIRCULAR BUILDINGS.** Such as are built with a plan that is circular on the exterior: if the interior be also one circular chamber, the building is called a ROTUNDA. 1.

The fashion, for circular buildings, revived by Charlemagne at Aix la Chapelle and other places in imitation of the church of the Holy Sepulchre at Jerusalem, was followed at a later period in many parts of the Continent, as at Charroux (eleventh or twelfth century?) near Civray in France. It was therefore no novelty when adopted by the Templars and Hospitaliers. A classic feeling was probably the cause that circular buildings were favourites with San Michele, as in the Pellegrini chapel to the church of S. Bernardino at Verona, and in the chapel of the lazaretto near that city (1591), and with Bramante as in the two storied edifice belonging to the church of S. Pietro in Montorio at Rome.

This subject has been illustrated by ISABELLE, *Les Edifices Circulaires*, fol., Paris, 1843; and is considered by FERGUSON, *Illustrated Handbook*, 8vo., Lond., 1855, pp. 562, 570, 758, 957.

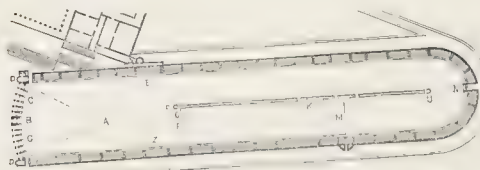
**CIRCULAR WINDING STAIRS.** Steps of a staircase having the treads radiating to a circle. TURNPIKE STAIRS; VICE.

**CIRCUMVOLUTION.** The name given to each turn in the spiral of the VOLUTE of the Ionic capital. 1.

**CIRCUS.** The Latin name for a structure enclosing a place (technically called *campus*, *spatium*, *æquor*, or even *arena*) appropriated to various but similar uses, of which the chief were chariot and horse races, *cursus*; equestrian military exercises, *ludus Trojæ*; mimic combats, both of cavalry and infantry, *pugna*; running, leaping, boxing, wrestling, and throwing the discus, *quinquertium* or *certamen gymnicum*; combats of animals with each other, and with men, *venatio*, until these were removed to the AMPHITHEATRE, which was thence sometimes called circus. These games, *ludi circenses*, were preceded by a procession, *pompa*, of priests accompanying the images of their gods, followed by the combatants, and by the persons officially connected in their public or private capacities with the peculiar occasion. Seats for the spectators appear to have been introduced in the time of the Roman kings, but were evidently of timber only: the word circus as used by VITRUVIUS simply means an enclosed place; and as the circus Maximus



was burnt in the time of Nero, Tacitus, *Annal.* xv, 35, only its walls could have been of brick or stone. No important remains exist of this building; of the circus Agonalis or Alexandrinus erected by Alexander Severus, and now represented by the piazza Navona; of the circus Apollinaris or Flaminius, converted by Augustus into a naumachia for the exhibition of crocodiles, and in later times used as a rope-walk when it was destroyed for the materials to build the Mattei palace by Maderno, and the church of Sta. Caterina de' Funari; or of any of the ten or twelve other such buildings which existed at Imperial Rome, except of the circus called that of Caracalla (but properly, according to NISBY, of Romulus the son of Maxentius), situated about two miles from Rome on the Appian Way. A plan, etc., of this is given in SAINT NON, *Voyage Pitt.*, fol., Paris, 1781, ii, 78, BIANCONI, PARIS, and others; but the illustrations given by CANINA, *Gli Edifici*, fol., Rome, 1851, are still more valuable. The semicircular end was pierced by the triumphal gate through which the victors left the circus; the



right hand wall was shortest, and the left hand wall was slightly inclined to H, at two-thirds of the way down its length: the SPINA ran rather towards the right hand side, and so left the entrance or throat of the course, F, wider than the corresponding exit. The segmental or elliptical line closing the further end or oppidum of the circus, was not square with the walls and spina (if they had been parallel): in the centre of this end was a gateway, *porta pompea*, B, dividing six *carceres*, C, from as many more; and it will be seen that there was an equal distance from the door of each *carcer* to the centre, A, of the course. At a few steps from the ends of the spina were placed the two bounds, G and H, each being a pedestal with three cones, *metæ*, upon it. The line F shows the supposed distance post, *alba linea*, and the line M the goal, which would render seven turns round the spina, K, equivalent to a very hazardous course of three miles in length. Opposite to this line was the stand, L, for the judges; the imperial seat, *cubiculum pulvinar*, being at E, and having in front the *porta libitina*, Z; the exhibitor, *editor*, of the games had a seat, *suggestus*, over the *porta pompea*. The vaulted space below the seats formed a covered promenade in case of rain; its lowest seat was raised and formed the barrier, *podium*, as there was no EURIPUS. The differences between the circus of Romulus and the representations of a circus on the medals of Trajan and of Caracalla, as well as on the *nummi contorniat*, appear to show that it possessed the improvements suggested by long experience. The general arrangement of the visorium, or ranges of seats, was probably the same in the circus as in the amphitheatre.

Some remains exist at Bovillæ, at Orange, and at Tarragona, and portions of a circus maritimus at Anagnia. According to GREGORY OF TOURS, *Hist. Fran.*, v, 18, Chilperic caused two buildings used under this name to be erected at Paris and Soissons, in which he gave shows to the people; the French antiquaries generally consider that these buildings were of timber.

6. 25. 40. 78.

The term is now given to a circular or elliptic area, more properly an amphitheatre, used for the exhibition of equestrian performances. This use of the word apparently originated before 1782, with the Circus in Blackfriars-road, London. FRANCONI so named the timber building with which in 1807 he superseded at Paris his and Astley's amphitheatre, established in 1780; it occupied several localities, but in 1835 was settled

at the Rond Point in the Champs Elysées, and was rebuilt (1841) to hold 6,000 persons, under the title of Cirque Olympique, but it is now called the Cirque de l'Imperatrice: the Cirque Napoleon, built still more substantially (1852) on the boulevard du Temple or des filles du Calvaire, is given in the *BUILDER Journal*, x, 810, xi, 105, both were designed by M. Hittorff: the Arènes Impériales (1851), for 15,000 spectators, and the HIPPODROME at Paris, had uncovered areas.

40.

Besides being applied to a public thoroughfare partly formed by houses into an elliptical or circular area, the word circus has been misemployed in modern times: for instance, it is given to the buildings erected in Italy for the game of pallone, as at Macerata (built by the architect Alcantari, and said to be the largest known), at Forlì, and at Bagnacavallo.

28.

CIRENZA, in the kingdom of Naples, see ACERENZA.

CIRADES, see CYRIADES.

CIRIGNOLA or CERIGNOLA. A city in the province of Capitanata in the kingdom of Naples. The cathedral, dedicated to S. Peter, a few churches, and a hospital, are the only buildings of importance.

96.

CIROFERRI, see FERRI (Ciro).

CISPO. Petid limestone; a yellowish brittle material, much used in the most ancient Etrurian monuments found round Chiusi. DENNIS, *Cities*, etc., 8vo., London, 1848, ii, 337.

CISSONIU is mentioned as architect to the emperors (supposed to have been Septimius Severus, Caracalla, and Geta, 193-211) in the following inscription, found at Naples: D. M. Q. Cissonio Q. F. Hor. Aprilii Veterano Coh. II. Pr. Architecto Augustor. Patricia. Trophime Viro Benemerenti. CAPACCI, *Hist. Neap.*, 4to., Naples, 1771, i, 289; GRUTER, *Corp. Inscr.*, 537. 5.

CISTERCIAN BUILDINGS. Some monks belonging to the Benedictine abbey of Molesmes in France, settled in a forest called Cîteaux in the diocese of Châlons, with a view of establishing a monastery where the Benedictine rule might be followed in its utmost rigour: they built a wooden monastery, erected their chapels 1098-9, and in twenty-five years sixty thousand Cistercian monks were spread from the Tiber to the Volga, from Mançanares to the Baltic; indeed nearly all Portuguese monasteries belong to this order, and that at Alcobaça is reputed to be the largest in the world; a hundred years later the order had eight hundred abbeys, and in the eighteenth century eighteen hundred monasteries and fourteen hundred convents, each having five or six granges (*grangie*), or still larger farms (*villæ*). Each villa was required to support at least thirteen monks if it aspired to become an abbey. A plan of the buildings of one villa called Outrabe, belonging to the abbey of Clairvaux, is given in VIOLET LE DUC, *Dict.*, s. v. Architecture, p. 275, who p. 267-286, illustrates several French abbeys. The Cistercians had their first house in England at Waverley in Sussex, 1128 (the third abbot of Cîteaux, Stephen Harding, was an Englishman); at the dissolution they had in this country seventy-five abbeys, of which thirty-six were ranked amongst the greater monasteries, and twenty-six nunneries, besides various cells. Among the most distinguished of these, so far as can be judged by existing remains, were Melrose and New abbey in Scotland, Basingwerk, Beaulieu, Croxden, Neath, Roche, Sallay, and Whalley, in England, besides Buildwas and Tintern illustrated with details by POTTER, *Remains*, fol., London, 1847, and Fountains, Kirkstall, Byland, Furness, Netley, Rievaulx and Roche illustrated with Tintern, by SHARPE, *Parallels*, fol., London, 1848; in both works the churches only have been given.

The Cistercians were farmers rather than architects; they did not adopt elevated spots for their estates, but generally chose marshy valleys, for the sake of irrigation: in such sites they chose the narrowest part of the valley for their buildings: such are Cîteaux and its "four daughters" Clairvaux, Pontigny, la Ferté, and Morimond. BENEDICTINE BUILDINGS.

The constitution of the order, as settled in 1119, prescribes water, a mill, a garden, and workshops, within the boundary

walls; great simplicity in the church; neither sculpture nor painting to be admitted; the glass in the windows to be white without arms or ornaments; neither timber nor stone bell towers of any great height; the dedication of all monasteries to the Virgin Mary; only useful animals to be reared; the granges to be not less than two Burgundian leagues from each other: but about the beginning of the fourteenth century the Cistercians relaxed their practice in favour of painting and sculpture, as at the nunnery of Maubuisson, 1236. All the Cistercian churches in Ireland are said to be remarkable for the shortness of their transepts and chancels, the latter being seldom more than one-fifth or one-sixth of the nave in length; on the other hand, the chancel arches are of ample width and lofty proportions. The windows at Pontigny (1114-24) are decorated with patterns formed by the lead; and as the rule commanded that the buildings should be simple, the absidal chapels of the churches at Pontigny, as well as at Clairvaux (1113), are angular, while those of the Cluniac buildings of the same period are semicircular. Four chapels on each side of the transepts, and a closed porch to the west end of the nave, were essential; and square ends to the choir are seen except at Clairvaux and Pontigny: at Clairvaux there was the peculiar arrangement of a double set of stalls, those in the choir for the monks, and those at the west end of the nave for the lay-brothers. Some other peculiarities are noticed in the *BUILDER Journal* by SHARPE, viii, 423, and by CLAYTON, ix, 143. S. Bernard, the great advocate of the order, gave a rule to the Templars; the military orders of Alcantara, Calatrava, and Montesa, were Cistercian; the Bernardines were monks dependent upon the abbey of Clairvaux; the Feuillants upon the abbey of N. D. des Feuillants; the Observantines were a branch of Cîteaux; and the Trappists are the Cistercians of the abbaye de la Trappe. CHAILLOU DES BARRÈS, *L'abbaye de Pontigny*, 8vo., Paris, 1844; DUBOIS, *Hist. de Morimond*, 1852.

**CISTERN** (It. *cisterna*; Sp. *cisterna*; Fr. *citerne*, *citerneau*; Ger. *cisterne*). The name given to one of the receptacles in which water is preserved for domestic purposes: reference to excavated works of the kind will be made in the articles *PISCINA* and *TANK*; notice here being taken only of the cistern used above ground. The French word *citerneau* was probably or rather evidently applied to the deeper of two connected tanks, which was employed to receive any deposit, and so keep the water clarified in the other; but in process of time this filtering cistern has become the smaller when used in another cistern, as shewn by VIOLETT LE DUC, *Dict.*, s. v. *Citerneau*, and has been so entirely lost in most countries, that the filter is now used to clarify the water coming from the cistern. The new filtering reservoirs may tend to another alteration. The system of filtration by double cisterns is given as a novelty by ETOX, *Survey of the Turkish Empire*, 8vo., London, 1799, p. 239.

The slate self-acting cisterns, shewn by Struthers in the Exhibition, 1851, were ingenious illustrations of the filtration of water by ascension; the filtering medium being packed between two pierced false bottoms, the water from the cistern at the top passed by a pipe into the fourth or bottom division, through the packing in the third, and rose in the second by the pressure of the water in the cistern, or top division. Batten cistern was the old term for the wooden casing, if any, of a metal cistern.

Cisterns of slate or of stone are undoubtedly preferable for domestic purposes to those of tin or LEAD, which latter is found to contaminate by decomposition the water when that is too pure; but both the former require to be carefully selected, and as carefully fixed: a complaint that the bottom of a slate cistern is porous may be sometimes true, but the cause of the complaint often proceeds from external condensation: coating the inside with pitch has been adopted where the first case occurs, and a ceiling under the cistern in the second: a thick coat of lime white is sometimes sufficient. Zinc of the best quality has been found to make a good lining for cisterns when there is no salt in the water. The supply, waste, and service, will be

noticed under PIPE. The size of a cistern is estimated by the imperial gallon, equal to 277·274 cubic inches of distilled water at 62°, which in air at 30 inches of pressure weighs 10 lbs. avoirdupois, so that a cubic foot holds about 6·23 gallons, and rather less than 1000 ounces of rain water, or 62½ lbs.

**CISTERNIS** (BARTOLOMEUS DE), or Bartolomeo della Cisterna, was of such repute that his visit to the ducal architect Bartolomeo (Buono?) at Venice, in 1448, was chronicled, according to MOSCHINI, *Guida*, Venice, 1815, i, 401. MANIAGO, *Storia delle belle arte Friulane*, 8vo., Udine, 1825, p. 151, shows that Bartolomeo was employed 1441 on the chapel of S. Giambattista in the church of Sta. Maria Maggiore at Udine, was dismissed the next year, and 1457 undertook to rebuild the church at Cividale, half of which however fell; the structure was rebuilt, except the great doorway, by Pietro Lombardo; CICCONARA, *Fabbriche*, fol., Venice, 1838, i, 88.

**CISTOPHORA**, see CORA.

**CISTVAEN**, see CELTIC BUILDINGS.

**CITADEL** (from the It. *cittadella*, diminutive of *citta*). A modern CASTLE, being a stronghold or fortified position, built on the highest or most commanding part of or near to a fortified town, and containing the usual buildings accompanying the permanent quarters of troops of all arms. 2. 6. 40.

**CITRINE**. The name given to the first of the tertiary class of colours, being composed of the secondaries orange and green, and resembling the colour of the citron. It includes the pigments called BROWN PINK, CASSIA *fistula*, CITRINE LAKE, and RAW UMBER. 9.

**CITRINE LAKE**. A durable pigment prepared from the bark quercitron, resembling but drying better than brown pink. 9.

**CITRUS**, the orange tree. That of Albania produces a fine grained wood of a yellow colour and without smell, used for turning and for ornamental work. The citron, the lime, and the lemon are of similar character. Of the tree called by this name, PLINY, *H. N.*, xiii, 29, xvi, 24, 34, states that veneers in the time of Cicero fetched very high prices. It was a native of Algeria, and supplied to the Romans the figured parts called 'tiger wood' and 'panther wood', according to their curling veins or concentric spots. It is stated that the Parisian cabinet-makers unanimously prefer a wood obtained from the same country, formerly known as THUJA, but now called CALLITRIS, to every other; this tree is supposed to be the same as the citrus of the Romans.

**CITTA DEL CASTELLO** or DI CASTELLO (the ancient Tifernum Tiberinum). A city in the legation of Perugia in the Papal States. The cruciform cathedral, dedicated to S. Florido, rebuilt 1457-92 in a Pointed style, was remodeled 1503-33 from designs given by Bramante Lazzari, it is said with his pupil Raffaello, who designed the pilaster capitals: the church was consecrated 1540; it resembles, but is larger than, the Chiesa Nuova at Rome: the façade, commenced in 1631 and carried in ten years as far as the capitals of the columns, is still incomplete: a Pointed doorway, the silver altarpiece, the stalls designed by Raffaello and executed by R. del Colle and F. di Castello 1533-40, the galleries, and the crypt or subterranean church, are shown with the chapel of the Sacrament; this and the present cupola were altered or rebuilt after 1789. Besides eight other churches, there are S. Francesco, formerly Gothic, with fine stalls; S. Domenico, of considerable size, with a wooden roof and Pointed cloisters, over which is another story bearing the date 1620; and Sta. Maria Maggiore, in a Pointed style, like the *palazzo comunale*, which was the episcopal palace until 1234, when it changed titles with the *palazzo vescovile*, remodeled after the earthquake 1789. The *palazzo apostolico*, built early in the fourteenth century, with a portico and the *loggia del grano* added in the seventeenth, when Barbione altered the present front; the palazzo Vitelli, a model palace, designed 1540 by the architect of that name near the porta S. Egidio; three other palazzi Vitelli; the palazzo Bufalini, attri-



buted to Vignola, and partly destroyed 1789, and seven other mansions; four nunneries; the hospital and its chapel; a *seminario*; and two theatres, are the chief other structures of interest. TITI, *Guida da Roma e descrizione del duomo Tiferne*, 12mo., Rome, 1686; MANCINI, *Istruzione*, 8vo., Perugia, 1832.

**CITTA DELLA PIEVE.** A walled city in the legation of Perugia in the Papal States. The cathedral, dedicated to SS. Gervasio and Protasio, was altered into a Latin cross 1607, and its two large chapels, the *seminario*, and the additions and repairs to the episcopal palace, date 1607-25. Three other churches, six monasteries, one convent, a college, several hospitals, and large but deserted palazzi, are the chief buildings. 96.

**CITTA DI CASTELLO** (MATTEO DI), see CASTELLO.

**CITTA DUCALE** or **CIVITA DUCALE.** A city in the province of Abruzzo Ultra in the kingdom of Naples. The cathedral, three monasteries, a nunnery, and a *seminario*, are the only buildings of importance. 50. 96.

**CITTA NUOVA.** A city, situated at the mouth of the river Quieto in Istria, is not named in many maps, nor by TSCHISCHKA, *Kunst*, 8vo., Vienna, 1836. The well built cathedral, dedicated to the Virgin, and three other churches, are the only buildings of importance. 50. 96.

**CITTA VECCHIA** (the MEDINA of the Saracens, NOTABLE of the Arragonese kings), is situated in the centre of the island of Malta; its magnificent palaces and fine houses are almost deserted. The cathedral, dedicated to S. Paolo, was rebuilt after the earthquake in 1693 from the designs of Gaffa; the catacombs are more spacious than those of Rome or Sicily; three miles distant are some rock-cut sepulchral grottos, called the Carthaginian tombs; and one mile from the city is the castle of Verdala, dating from the sixteenth century. 28. 50.

**CITY.** The definition of this word given by COKE and by BLACKSTONE, viz. 'a town incorporated which is or hath been the see of a bishop' has always been opposed, yet no more accurate explanation is afforded by COWELL, *Interpreter*, fol., London, 1727, or by DUCANGE, *Gloss.* s. v. The Roman empire, when separated under Theodosius into four prefectures, each having more than one diocese (not ecclesiastical) was divided into provinces; and the province was further subdivided into *civitates*, or states, or as they would now be called a city and county: each city, *urbs* or *oppidum*, had a FORUM, CURIA, GYMNASIUM, public BATH, THEATRE, and in later times a CATHEDRAL CHURCH. In the course of time any town, having a cathedral, was a city; and the name sometimes remains, as at Westminster, when the place is no longer the seat of a bishopric; on the other hand, Dorchester in Oxfordshire, Sherborne, and Thetford, among other places that were formerly cathedral, are no longer called cities; Coventry is an episcopal city although its cathedral church is destroyed; Bath is an episcopal city which never had a cathedral church; and when the collegiate churches at Manchester and Ripon were made cathedral, Manchester obtained by letters patent 1852 that rank. Marino, S. Giovanni in Persiceto, and other towns in Italy, have been created cities, but are not episcopal. The title is also given by deference to ancient records, as in the cases of Cambridge, Gloucester before the creation of the bishopric, 1541, and Leicester; and by custom to very important towns, such as New York, and to the capital of a state, whether a cathedral city or otherwise. The various systems of plan as regards a city will be noticed in the article TOWN. 2. 40. 96.

**CITY GATE** and **WALL**, see BAR; BARBICAN; GATEWAY; WALL.

**CITY HALL**, see GUILDHALL; HALL; HÔTEL-DE-VILLE; TOWN HALL.

**CIUDADELA.** A walled city, formerly the capital of the island of Minorca, belonging to Spain. It has five gates, a cathedral, dedicated to N. S. de la Purificación, in a Pointed style, built as is supposed before 1360, being one large nave, with a square tower and an octagonal spire; two churches, four chapels, two monasteries, and a convent. 50. 85. 96.

**CIUDAD RODRIGO.** A city in the province of Leon in Spain. The walls, with three gates, probably belong to the same period as the cathedral, which is said to have been built by Ferdinand II of Leon (1190). The nave, 80 ft. high, has a clearstory and two aisles, each separated from it by eight pillars. It is altogether 140 ft. wide, and the *crucero* or transept is 90 ft. high. The design is attributed to B. Sanchez, who is buried in one of the two cloister-alleys which he also erected; the other two, by Pedro Gomez, are more modern; the *presbiterio* and the junction of the *capilla mayor* with the church date 1538-56; the capilla del Pilar was designed 1738-41 by Pontones, and a portal and a tower 1730-76 by Sagarinaga, who also erected the *seminario conciliar* in the city, and the Premonstratensian monastery and its cloister, about two miles distant. The ruined elegant capilla de Cerralbo, 1588, and the Augustinian church are still more important than the eight other churches, the alcazar or palace-fortress, designed by Lope Arias, 1372 (the inscription says it was commenced 1410, owing to the difference of era), or the magnificent modern bridge over the Agueda outside the puerta de la Colada. 28. 50. 66. 85. 96.

**CIVERY**, see CIBORIUM and SEVERY.

**CIVIC** and **CIVIL BUILDINGS.** These terms, though often confounded, are clearly separate. Civil buildings consist of all structures not strictly belonging, like fortresses and ships, to military and naval purposes. Civic buildings form only a small portion of these works, as the hall, mansion house, chapel, offices, civil and criminal courts, prisons, militia and police barracks, bars, bridges, markets, exchanges, schools, hospitals, almshouses, and ward houses or inquest rooms, which are the property, and occupied by the officers, pensioners, or prisoners, of a corporate city or town: the halls, offices, schools, and almshouses of a guild, are sometimes erroneously considered to be civic buildings, because belonging to a corporate body. Buildings of the Church, of companies, etc., may be public or private buildings, and are not included in this last definition.

**CIVIL ARCHITECTURE**, see ARCHITECTURE.

**CIVIL ENGINEERING.** The profession of civil ARCHITECTURE has latterly been divided into two branches, whose members are distinguished as ARCHITECTS and as Civil Engineers (INGENIATOR). The pursuits of the architect may be held to be more intimately connected with the æsthetical portion of the work, whilst those of the civil engineer are more intimately connected with the scientific part. Evidently, however, such a distinction is arbitrary, and very unsatisfactory; for it is impossible to erect a fine building of any considerable dimensions without the application of many scientific principles; and, on the other hand, a civil engineer cannot erect a fine bridge without an intimate knowledge of the laws of æsthetics. Yet, in the general occupations of the architect and civil engineer, the distinction thus endeavoured to be made will be found to hold good; and the studies required to design a fine building are so essentially different from those classes necessary to form a canal, water supply, gas works, a sea port, or a railway, that few men have sufficient grasp or versatility of intellect to be able to excel in both.

To a very recent period, however, no such distinction existed, and all the works connected with building were considered to belong to the province of the architect. Mansard built the pont Royal at Paris, Mylne built Blackfriars bridge, and Telford built a church, before he confined his attention to civil engineering. The great names of the Renaissance, such as San Michele, Buonarroti, Vignola, and very many others, admitted no distinction between the art and the science, but excelled in civil and military engineering as much as in civil architecture; whilst Vitruvius and Frontinus give little reason to suspect that amongst the ancients any kind of separation existed between architects and engineers. It dates, indeed, only from the establishment of the *École des Ponts et Chaussées* by M. Trudaine in 1747, an establishment placed by him under

the able direction of Peyronnet, even then known only as *architecte du roi*; and perhaps such men as Smeaton, Jessop, Ralph Walker, Rennie, and Telford, may be considered to have been the first, who practically established the separation in our own country, where official regulations so hedge in military pursuits, that the mere holding a commission or not suffices to establish another distinction, and the military engineer practises both as an architect and as an engineer. The same subclassification of military and civil engineers exists on the continent; but there also the profession of civil engineering is still further divided into the mining and mechanical branches, and in France a still further subclassification of the engineers of naval constructions, ship builders, in fact, has since 1800 been established. There appear to be some reasons for the adoption of these various distinctions, and for limiting the application of the term civil engineering to the pursuits of those who are entrusted with the execution of building operations, in which it is more essential to study the physical laws of matter, than the effect such buildings may produce upon the eye. It may be briefly stated that civil engineers are the architects employed to direct works connected with bridges, harbours, roads, canals, docks, water supply, sewerage, drainage, irrigation and warping of land, gas works, and foundations of buildings to be erected under peculiar local difficulties. Perhaps the works connected with the establishment of the electrical telegraph may also be included in the sphere of a civil engineer's duties; and certainly the erection of lighthouses is a portion of his pursuits, although from the great elegance of the modern French lighthouses they must be included among structures susceptible of being treated as works of art. G. R. B.

**CIVITA CASTELLANA.** A walled city in the legation of Viterbo in the Papal States. The site exhibits portions of ancient walls, sewers and tombs, belonging to the Etruscan Falerium. Almost every large tomb has the peculiarity of exhibiting, besides one or two inner rooms with shelf-like receptacles for the corpses, an antechamber about 5 ft. square, with an oblong flue for ventilation and entrance after the doorways had been closed, by slabs slipped into grooves made in the door posts. The citadel, designed 1500 by Sangallo, is now a state prison for 150 persons; the bridges, one being mediæval and carrying the road over which is the modern aqueduct, is itself carried by an arch of Etruscan workmanship; the other, 120 ft. above the river, was built 1712; the only relics of the former five-ailed duomo are a Lombardic doorway dated 1210, and an antique mosaic pavement, both preserved in the cathedral, dedicated to the Annunciation, which was erected in a Pointed style but was reduced to three aisles and completely modernized in the interior in 1717; the fine marigold window and the rich *cinquecento* portico or loggia of the Ionic order inlaid with coloured marbles, are specially noticed: the other chief buildings are two churches, a monastery, a convent, a *seminario*, an hospital, an asylum, a prison, a poor palazzo municipale, and the palazzi Androssilla, Castellan-Ciotti, Petroni, and Stella. Four miles distant is Sta. Maria de Falleri, the Roman Falerium, with red tufo walls of *opus emplectum*, 7 ft. thick, and in parts 50 ft. high and nearly perfect, with more than fifty rectangular breaks as towers at intervals of about 100 ft., and seven arched gateways; the site of the theatre was discovered 1829-30; there are also many Etruscan and Roman tombs, one of which is unique in regard to its cornice of masonry, and almost so for its portico of three large arches. The columns of the abbey church, built in the twelfth century, remain, but it was deserted in 1829, when the roof fell. DENNIS, *Cities*, etc., 8vo., London, 1848, i, 115; CANINA, *L'Antica Etruria Marittima*, fol., Rome, 1846. 50. 96.

**CIVITA DI PENNE**, in the kingdom of Naples, see PENNE.

**CIVITA VECCHIA** (the Roman CENTUM CELLÆ). A maritime city in the legation of the same name in the Papal States. The antiquities consist of the remains of an aqueduct, of

ARCH. PUB. SOC.

thermæ, and of a basilica or temple; there are also indications of a portico to the harbour, which is considered a *chef d'œuvre*. The fortress, called one of the finest monuments of military architecture, was commenced 1508 by Bramante, and finished, with the *maschio* or octagonal tower by M. A. Buonarroti, 1534-50. The *arsena* or *bagno*, for twelve hundred prisoners, was restored on ancient foundations 1560-6. The arsenal has a façade designed by Bernini 1655-67. The aqueduct, twenty-seven miles in length, was constructed by Fontana 1691-1700. The cathedral, dedicated to S. Francesco d'Assisi, was built 1769-75. There are three other churches, four monasteries, a female asylum, an orphan asylum, 1762-6, which is the date of the civil and military hospitals, facing each other, and of the *fabbrico del scaricatore*; a *palazzo della camera apostolica*, consisting of a tower and of portions about 1503-66, but repaired a little before 1840; an episcopal palace, 1585-90; a *seminario* of the same date; a large *lazzaretto*; a *palazzo comunale*; and two theatres. A good plan of the city is given in ZUCCAGNI-ORLANDINI, *Atlante Geografica dell'Italia*, fol., Florence, 1844; FRANGIPANI, *Istoria della Città*, Rome, 1761; MANZI, *Stato*, 8vo., Prato, 1837. 96.

**CIVOLI** (DOMENICO) of Bologna, born 1705, was the first master of Francesco Tadolini, and died 1778. Nothing remains of his works, which are highly praised by MILIZIA, *Opera*, 8vo., Bologna, 1827, iv, 483.

**CLADDING.** The term used in Norfolk for boarding to slates or lead. A. H. M.

**CLAGNI** or **CLAGNY**, and **CLERMONT**, see **LESCOT** (PIERRE).

**CLAIRECOLLE**, now written **CLEARCOLE**.

**CLAMP.** The name given to a piece of wood receiving in a groove on one edge the rebated ends of other pieces, for the purpose of preventing the warping of those pieces. It is sometimes cut with a mitre end. The separation of the clamp from the butting ends is sometimes prevented by the use of a little glue applied to the centre board, but sometimes by a tenon placed in a mortise near each end of the clamp. 1. 2.

**CLAMP.** An instrument used by joiners and others for holding together pieces of wood about to be secured to each other. Bowery's improved clamp, illustrated in the *SOCIETY OF ARTS*, etc., *Trans.*, 8vo., London, 1845, iv, 42, is also a bench hook. In the same work Smith's lever cramp is described, 1828, xlvii, 105, with his improvement upon it, 1832, xlix, 73; and a jointing and compressing screw clamp, patented in 1848, is illustrated in the *CIVIL ENGINEER Journal*, xi, 373; as applied to the laying of floors. Similar tools called cramps, patented by Bissell, and by Kimberley, which are very simple, are figured in the advertisements of the *BUILDER Journal*, Nov. 10, 1855.

**CLAMP.** A large mass composed of dried bricks arranged for burning; it is generally quadrangular in plan, and is of various dimensions, from 6 ft. to 14 ft. high, and 80 ft. long by 60 ft. wide, more or less. The burning is effected by fire laid in the centre assisted by flues prepared in stacking the clamp, and by breeze, cinders, or small coal laid between each course of bricks. BRICK, MANUFACTURE OF, p. 139. KILN.

**CLAMP NAILS** were used to fasten clamps in building, and repairing ships and other vessels. 4.

**CLAPBOARD.** A term probably derived from the German *klap-holz* or *klapper-holz*, translated 'barrel-staves, clapboards' by LUDWIG, *Lex.*, 4to., Leipsic, 1789. COTGRAVE, *Dict.*, 1650, mentions 'clapboard for caske', and BAILEY, *Dict. Brit.*, fol., London, 1730, explains the word as 'a board cut ready for the cooper's use'. In the same sense clapboard is mentioned in the Acts 35 Henry VIII, cap. 8, and 35 Elizabeth, cap. 11. EVELYN, *Sylva*, 1662, states that the English oak "is good for . . . clapboard for wainscot, and some panels curiously veined, of





CLAVEL and CLAVY. A word formerly familiar in most parts of England for a mantle piece or shelf over a fireplace.

CLAVIS. An old term for a quantity of lead; see CARRAT; and for the keystone of an arch.

CLAY (Fr. *argile*; Ger. *thon*). The secondary and tertiary deposits from the decomposition of older rocks, in which the principal ingredients are silica and alumina, are known mineralogically by the name of "clays". Their compositions are extremely various, as are also their mechanical properties, and the uses to which they are applied in the arts. Without therefore attempting to describe them all, it may suffice to mention some of the most important varieties.

1. *Kaolin clay*, the substance which forms the basis of porcelain wares, results from the decomposition of rocks containing a large proportion of felspar, and this decomposition seems to have taken place under such peculiar conditions as to induce geologists to suppose that it must have been effected at great temperatures, and under great pressure. It is white, friable, easily moulded when moist, and fuses with difficulty. Being composed of silica, alumina, and hydrogen, it is represented chemically by the formula  $\text{SiO}_2$ ,  $\text{Al}_2\text{O}_3$ ,  $2 \text{H}_2\text{O}$ . Large deposits of it exist in Devonshire and Cornwall, in Ireland, in China, in France near Limoges, in Saxony, and in Spain.

2. *Pipe clay* is generally white, of variable fusibility, tenacious, and often containing a sufficient quantity of lime to entitle it almost to be classed with marl, although its usual composition is a very pure silicate of alumina; it burns white in the furnace.

3. *Potter's clay*, used for ordinary pottery ware, contains in addition to silica and alumina, variable proportions of lime and iron, and many accidental impurities, as fragments of stone, nodules of iron pyrites, and sand. It is to these impurities that the different degrees of fusibility of potter's clay may be attributed, and whenever the iron approaches to 5 per cent. of the whole mass, the fusibility is so great that it is not possible to burn the goods thoroughly: the peculiar red colour of ordinary pottery is also to be attributed to the presence of the iron in the clays from which it is made. The potter's clay of the neighbourhood of Glasgow may be taken as a good type of the class, and they are stated to be composed as follows:

Silica	-	-	49.44
Alumina	-	-	34.26
Protoxide of iron	-	-	7.74
Lime	-	-	1.48
Water	-	-	1.91
Magnesia	-	-	5.14
100.00			

4. *Fire clay*, in England principally found associated with the coal measures, owes its name to its power of resisting the action of heat; it is plastic, and easily moulded in its ordinary state into the bricks and lumps so extensively used for boiler setting, and for the construction of kilns and stoves. The ordinary composition of *fire clay* is stated by COWPER to be:

Silica	-	-	69.33
Alumina	-	-	23.62
Protoxide of iron	-	-	5.56
Lime	-	-	1.49
Magnesia	-	-	a trace
Total - - - 100.00			

The varieties most used in commerce are the Stourbridge, the Welsh, and the Newcastle clays, which differ principally in the quantities of iron they contain.

5. *Fuller's earth* is principally used to remove oil from wool immediately after spinning the threads, on account of the facility with which it forms a species of soapy detergent when mixed with water. According to RICHARDSON it is composed of

Silica	-	-	46.30
Alumina	-	-	25.10
Peroxide of iron	-	-	9.40
Magnesia	-	-	1.15
Lime	-	-	a trace
Water	-	-	18.05
Total - - - 100.00			

It is too fusible for plastic purposes, in consequence of the large proportions of alumina and iron, and the conditions under which these occur.

6. *Stone ware clay*, or sandy clay, is distinguished from the ordinary materials of the same class by the large proportion of silica it contains, in consequence of which presence it is enabled to resist the degree of heat to which it is exposed when receiving the salt glaze usually applied; the Aylesford stone ware clay is porous, until the glaze is applied. Stone ware clay is found in Dorsetshire and Devonshire, and also in Belgium, France, Germany, and other countries. Its constituents are usually as follows:

Silica	-	-	66.68
Alumina	-	-	26.08
Protoxide of iron	-	-	1.26
Lime	-	-	0.84
Magnesia	-	-	a trace
Water	-	-	5.14
Total - - - 100.00			

7. *Brick clay* is of very variable composition, but as a general rule it should be free from any excess of lime (in the form of carbonate) from animal or vegetable impurities, and from iron pyrites. The proportion in which the silica exists in the mass materially affects its capabilities in manufacture; for when the mass is almost entirely composed of alumina, the clay is very likely to be, as the workmen call it, *too fat*; when there is too much sand present the clay is said to be *poor*. The fat clay shrinks and warps in burning, and is therefore only used for tiles, or bricks of a soft texture and inferior quality, and these not exposed to great heat in the kiln; the poor clay, again, is not so plastic as the fat, and is therefore not so free for moulding, and is even at times but ill adapted for the manufacture of the most ordinary description of brick. When brick earth contains much lime it is called *marl*, and yields bricks of a whitish colour, which when well burnt are of a close, hard, and even texture: clay in which much sand exists is able to resist the commencement of fusion, and is used for the manufacture of *clinkers* or hard paving bricks. ATMOSPHERIC INFLUENCE. BRICK, MANUFACTURE OF. CERAMIC ARTS. MORTAR.

Geologically also the clays are known by various denominations, according to the strata or formations, with which they are associated. Thus there are the new red sandstone clays and marls, the blue lias clays, the Oxford clays, the boulder clays, the London clays, and the plastic clay series; whilst perhaps the earlier secondary formations would add an equal number of names to the list. In all cases the composition of these clays is variable, and the differences between the organic remains they contain are even more strongly marked than those of their mineral constituents.

G. R. B.

CLAYING, see PUDDLING.

CLAY WALLING. The *BUILDER Journal*, 1847, v, 330, mentions cottages built in India of clay, which are filled and surrounded with wood faggots, fire is then applied, and the whole structure is thus thoroughly burnt *en masse* before habitation: PISÉ; COB WALL: and in 364, it gives an account of a barn erected in Suffolk about 1817 with walls made of sun-dried bricks 24 ins. long, 12 ins. wide, and 9 ins. thick. Such construction is not unusual at present in Norfolk, as described in the same work, v, 364, 388.

CLEANDER constructed at Rome the baths for the emperor Commodus, A.D. 180-193; LAMPRIDIUS, *Commodi*, 17.

CLEARCOLE or CLAIRCOL (Fr. *claircollo*, i.e. clear size). A composition of size and white lead. A cheap mode of painting for attics, kitchens, and old houses when dispatch is necessary, or where it is essential thus to paint often. One pound of white lead ground in water and mixed with a quart of size will be found to dry almost immediately. In the second or finishing coat the white lead should be mixed in half linseed oil and half turpentine, used as stiff as possible, with the addition of a little blue black to take off the extreme whiteness, or with a colour if preferred, and a small quantity of dryers.

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Clearcole is also applied to ceilings before whitening them, but it should never be applied to enrichments, as it speedily destroys all sharpness in them. By painters it is sometimes used instead of a coat of paint, but not having a body it seldom answers the desired purpose; and it is likewise apt to scale off. Where the work is greasy or smoky, clearcoling then prepares the work better for the oil paint, though other methods could be found for the purpose. Thus it is sometimes applied to cover old papering to receive the new, where stripping the walls is likely to injure the plastering. It should not be laid on joiners' work. **COLF.**

**CLEARSTORY, CLARESTER, CLARESTORY, CLERESTORY, CLERINSTORY, CLERSTORY** (Fr. *clair étage, claire voie*). A long opening or row of openings in the upper part of a screen or wall. 'Ovyrstorye' or 'ovyristorye' is the expression always used for the clearstory of a church by **WILLIAM OF WORCESTER**; while triforium is used for the clearstory gallery as well as for the lower one in the description of Canterbury cathedral by **GERVASE**; sometimes both are called merely 'ALURE'. **HOLMES, Academy of Armory**, fol., Chester, 1688, iii, 109, 112, 473, has defined clearstory windows as "windows that have no transom or crosspiece in the middle of them to break the same into two lights; **BLOMFIELD, Hist. of Norfolk**, fol., Norwich, 1745, ii, 536, has misused the word for *sedilia*. **WILLIS, Architectural Nomenclature**, 4to., Cambridge, 1846, mentions besides the above, the use of the word 'clerestorial windows' in the contract, 1435, for building the church at Fotheringhay in Northamptonshire; but the variations made from the contract in the execution of the work render the text useless, except where it speaks of the clearstory in the present sense of the word.

The term clearstory is now always restricted to the pierced walling, i. e. line of windows and piers between the roof and the triforium, in the nave or centre aisle of a church; and if there be no triforium, then the same space of walling between the roof and the crown of the moldings of the pier-arches to the nave. There has been considerable difference in the design of this feature, as witnessed in S. Martin at Angers, Sta. Maria at Toscanella, S. Miniato at Florence, Notre Dame du Port at Clermont-Ferrand, and SS. Giovanni e Paolo at Rome, which last has an enormous clearstory divided on each side into three bays by buttresses, and has each bay pierced by two tiers of round windows, four in each tier. In England the best examples in early work generally show small trefoiled or quatrefoiled circular windows, as at Trumpington in Cambridgeshire; or small single lancet openings; examples are not very common in the early periods of the Pointed style, but Elsworth and Bottisham in the same county, both with roofs of later date, may be cited: on the contrary, the abbey church of Altenberg, 1255, has a large clearstory with geometric tracery not foliated.

The Third Pointed period exhibits a fashion for clearstories, both as original and as additional work; and consequently examples are so numerous that it is sufficient to observe that while the priory church at Bath has a large and lofty clearstory but no triforium, the choir of the cathedral at Bristol has neither triforium nor clearstory. The Norfolk and Suffolk churches are remarkable for the size and number of their clearstory windows, which in many cases are accompanied by elaborate coeval roofs. The clearstories of some of the French cathedrals attained remarkable slowness; such is also the case at Cologne. This subject occupies a section in **BRANDON, Analysis**, 4to., London, 1847, p. 35; and the *Ecclesiologist Journal*, 1845, iv, 104. **BLIND STORY.**

**CLEAT or CLEET.** A small projection of wood or iron fixed to timber work as a handle to which ropes may be fastened.

It is also the small block (Fr. *chantignolle*) nailed on principals to prevent purlins from slipping or thrusting forward; also on posts to form a bearing when timbers are not housed into them, and for abutments in raking shores. 1. 2.

**CLEFT or SHAKE.** An open crack or fissure in wood. The carpenter usually fills such cracks with a mixture of glue,

or of gum and sawdust (**BADIGEN**), or of grease and sawdust; but **ELLIS, The Timber Tree Improved**, etc., 8vo., London, 1738, p. 12, observes that 'for closing the clefts and chops of green oak wood, it should be anointed and supplied with the fat of powdered beef broth, used with a sponge and done twice over.' 'Wind-shook timber has been so exquisitely closed as not to discern the defects.'

**CLEMENT** (**Eudes** or **Odo**), abbot of S. Denis near Paris, 1228-45, when he was made archbishop of Rouen, died 5 May 1247. He is regarded as an architect by **FELIBIEN, Histoire de l'Abbaye**, fol., Paris, 1706, pp. 237, 253, 528, app. cciv-cvii, who fixes the exact periods of parts of one of the most interesting buildings in France. 1231 "Cæpit Odo abbas renovare capitulum ecclesie B. D. A. et perfect illud usque ad finem chori hoc excepto quod turris ubi sunt cymbala a parte revestiarum non erat perfecta nec voltatus erat chorus sed a parte Sancti Hippolyti totum erat perfectum et etiam voltatus erat a parte vestiarum.—1281 consummatum est novum opus ecclesie B. D. A. à Domino Mathæo Abbate", i. e. Mathieu de Vendôme, elected 1258, died 1286.

**CLEMENTI**, or **CLEMENTI SPANI**, or **SPANI**. The family name of several artists, descendants of Giovanni Spani of Cremona through Clemente Spani, who appears to have settled at Reggio. Bartolommeo his son is noticed as a sculptor, goldsmith, and statuary, 1494-1513; **TIRABOSCHI, Notizie**, 4to., Modena, 1786, pp. 160-178, 399, attributing to him the palazzo ducale at Carpi, says that he erected the façade of the priory church of S. Giacomo (1518), and the highly praised portal of the palazzo Donelli (afterwards Cerreti?); adds a list of his fonts, tombs, etc.; gives the epitaph which shows that this artist died 1525; and notices the contract made 1542 to alter or build the torre dell' orologio by Girolamo his son, who began the change of name, and whose brother Bernardino had a son Prospero Clementi. **TIRABOSCHI** gives a list of tombs, which are works of architecture, by this Prospero, and the epitaphs in the cathedral which show that this artist must have been born about 1500, as he died at a very advanced age 26 May 1584.

**CLENCH or BOAT NAIL.** A sort of nail commonly used in building large boats, and useful for any boarding, as they will drive or draw without splitting the wood; the finer sorts have clasp heads. **BOTHOM NAIL.** 4.

**CLENCHING**, see **CLINCHING**.

**CLEODAMAS with ATHENÆUS**, both of Byzantium, were employed by the emperor Gallienus (254-268) to restore the cities destroyed by the Scythæ and other invaders; **TREBELLIVS POLLIO, Gallieni**.

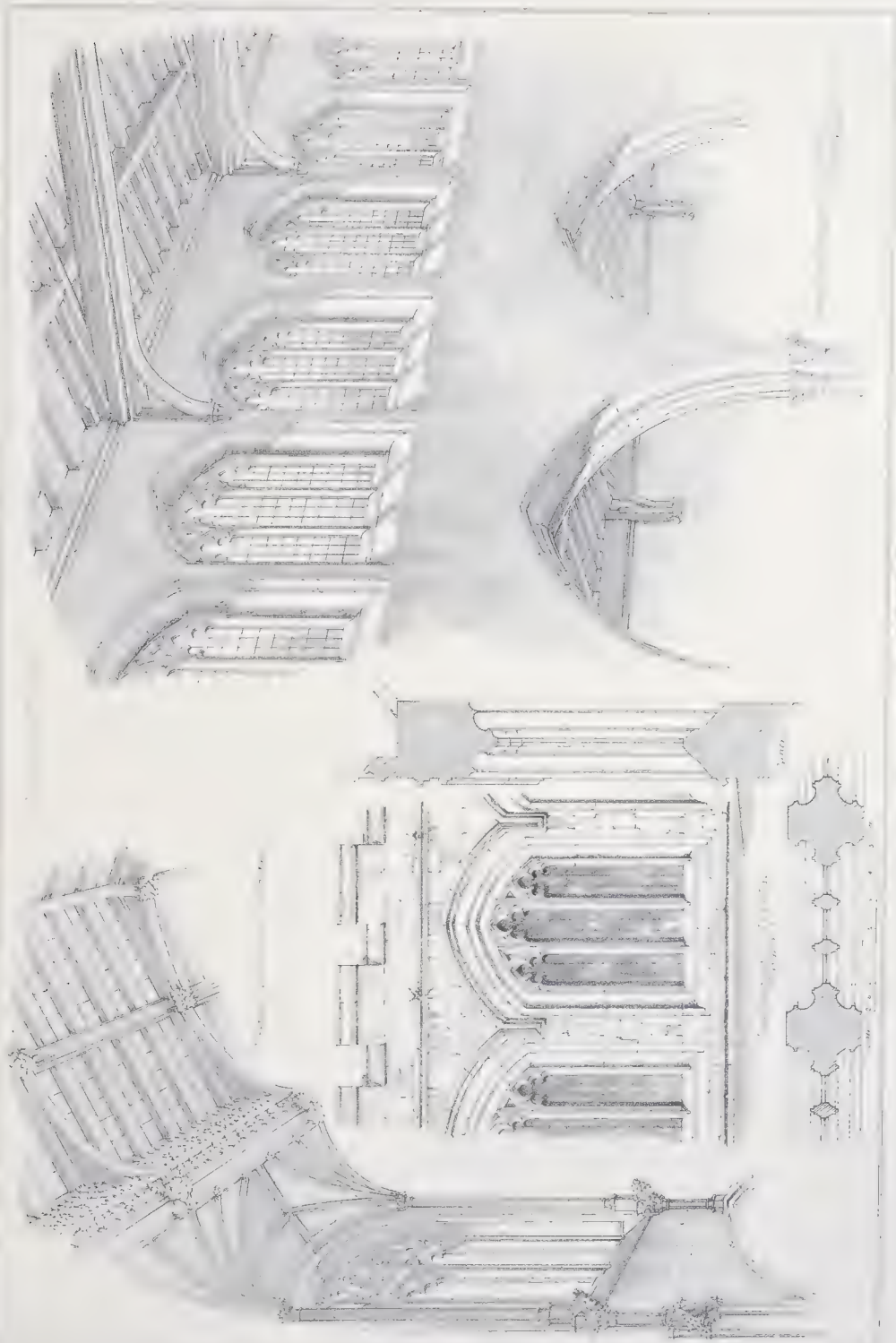
**CLERC** (**MAITRE CLÉMENT LE**), styled 'architecte à Bourbon', was consulted on the erection of the northern tower to the cathedral at Bourges, 1508-42. **COMITÉ HISTORIQUE DES ARTS**, etc., *Bulletin*, 8vo., Paris, 1842, ii, 469.

**CLERE** (**ACHILLE LE**), see **LECLÈRE** (**ACHILLE**).

**CLERK**, see **ARTICLED CLERK**.

**CLERKENWELL** (**WALTER DE**), chaplain, was appointed 1304 to superintend the construction of two new chambers for the king and queen in the palace of the archbishop of York at Westminster. **BRAYLEY and BRITTON, Hist.**, 8vo., London, 1836, p. 92.

**CLERK OF THE WORKS.** A person appointed to superintend the various works connected with a building, in order to ensure the faithful execution of the works ordered by the architect. It is essential that a clerk of the works should be a man of strict integrity; well acquainted with the various branches of trade, and the natures and properties of the building materials to be employed; able to set out at full size, and give instructions with respect to, the sketches and drawings furnished by the architect; watchful that the builder performs his engagements; and unremitting in his attendance. He ought to be entirely under the orders of the architect, and should receive from the employer a remuneration adequate to the services. **G. R. H.**







The duty of a clerk of the works is, not to take upon himself the office of builder's foreman (as is too often the case), but to watch, and assist in, the setting out of the work, to examine closely into the way the builder carries out his work, and to report to the architect whatever he observes amiss; to communicate regularly to the architect the result of his observations, and to ask for instructions as questions or difficulties arise. An architect endangers the interests of his employer, and risks his own character, by delegating too much power to the clerk of the works.

S. S.

CLERK OF THE WORKS (in late Latin *clericus operationum*) appears to have been the official title, at least till the time of Henry VII, of an officer belonging to the royal household. His post was equivalent apparently to that of surveyor in the time of James I and Charles I, and to that of ARCHITECT at the present time. The "appellation is still continued to the supervisors of the works in the royal palaces, but with lower powers of authority. The clerk of the works was formerly the superior and controlling officer of all matters connected with the king's buildings"; HUNT, *Exemplars*, 4to., London, 1836, p. 175. After Clerkenwell (in orders) in the reign of Edward I, and Chaillou in that of Edward II, the names occur of Chaillou again, Kelleseye, Feriby, Weston (in orders), Bruges, Campsall, Stapulford (in orders), Lambeth, and Sieford (in orders), as clerks of the works or surveyors successively in the reign of Edward III, 1327-77; of Chaucer 1389, Gedney 1391, Alderne 1427, Cleve (in orders) 1445, and Hunt 1483-5. The salary in 1365 was £18:4:0 per annum; their successors, called surveyors, received in 1593 and 1610 £36:10:0 per annum. Until within a few years, the city architect was always styled 'clerk of the works' by the corporation of London.

CLERMONT (the Latin *Augustonetum*), called Clermont-ferrand after its union 1633 with Montferrand. The capital formerly of the province of Auvergne, but now of the department of the Puy de Dôme in France. The houses, built with the dull grey lava of Volvic, have been of late continually whitewashed to give a more lively appearance to the city. The supply of water is plentiful, but the quantity of lime it contains renders it necessary to clean the main pipes every three months; a natural bridge called Tiretaine, 112 ft. long, 12 ft. wide, and 16 ft. high, has been formed by such a deposit. The fountain, 22 ft. high, in the *style de la Renaissance*, executed when the episcopal palace was rebuilt, 1511-16, for bishop Jacques, the brother of cardinal Georges d'Amboise, but not then finished, and altered as to its large octagonal basin (now circular) when removed 1799 to the place Delille, MOYEN AGE PITT., pl. 88; and a monumental obelisk to general Desaix, the hôtel Dieu and other hospitals, the Massillon library, and the other state and municipal structures, inclusive of the *halle aux toiles* on 160 columns of Volvic lava, 12 ft. high in the shaft, are of less architectural interest than the following buildings. The cathedral, dedicated to Notre Dame de l'Assomption, but still incomplete, stands on foundations laid in the tenth or eleventh century: the present choir and its apses were commenced 1248, and continued till 1265 by the architect Jean des Champs (Johannes de Campis, buried with his wife in the sacristy). The five easternmost bays of the cathedral at Clermont date from the first part of the fourteenth century; the west front shows the Romanesque work: the aisles and chapels have flagged flat roofs. The roof of the nave rising to 108 ft. above the pavement; the rose windows of the transepts; the west window of the fifteenth and sixteenth century; and the painted glass of the thirteenth century, deserve notice. The length is 328 ft. and the width 140 ft. Of the five parish and other churches, S. André, with the tombs of the counts of Clermont and of the dauphins of Auvergne, and Notre Dame du Port, are the principal. The latter, 152 ft. 6 ins. long and 46 ft. wide inside, belongs to the eleventh century. VIOULET LE DUC, *Dict.*, s. v. Chapelle, pp. 458-9, gives views of the absidal chapels of its choir and crypt; RAMÉE, *Histoire*, 12mo., Paris, 1843, p. 149, gives its plan and dimensions.

ARCH. PUB. SOC.

sions; MALLAY, *Eglises Romanes*, fol., Moulins, 1838, and GAILHARAU, *Mons.*, etc., ii, 78, have published it architecturally; LABORDE, *Monuments*, fol., Paris, 1816, pl. 139-40; SOMMERARD, *Atlas*, iii, 2; MOYEN AGE PITT., pl. 131; MOYEN AGE MON., pl. 41, 77, 121; and NODIER and TAYLOR, *Voy. Pitt.* (Auvergne), fol., Paris, 1829, pl. 51-62; the latter authors also give illustrations of the cathedral, etc. The château of Tournelle and the church of Montferrand, in the vicinity, are worth notice.

28. 96.

CLEVE (WILLIAM), "the king's poure chapeleyn" in 1445 petitioned for a good assignment of £1000 for the works directed by the Privy Council to be done at Eltham, Shene, and Westminster, he being then still unpaid for the new kitchen and its offices, and a new draft-bryge lately made by him as clerk of the works at the Tower: NICOLAS, *Proceedings, etc., of the Privy Council*, London, 1837, vi, 31, gives details of all these works.

CLIMAX. A Greek term corresponding to the Latin *scala*, employed for flights of stairs, and especially for the lines of steps in the ancient theatre radiating from a common centre, that of the orchestra, and running from the lower to the upper rows of seats, so as to enable the spectators easily to reach their places in the *coilon* or *cavea*, which consequently became divided into wedge shaped masses (*κεκλιδαι*); STUART, *Antiq.*, suppl. volume, p. 33, gives a plan. CERCIS; CUNEIF. T. I. D.

CLINCHER. A cramp; a holdfast; a piece of iron turned down to fasten planks.

CLINCHING. The act of turning over the point of a nail when it has penetrated through a piece of wood, thus driving it backward into the wood: a hammer head or other piece of iron is generally pressed during the operation against the head of the nail to keep it down. CLENCH NAIL.

1. 2.

CLINKER. This has usually been described as the name of a brick burnt more thoroughly than the others by being nearer to the fire; while a 'burr' is the proper name for a mass of several bricks run together by too fierce a heat.

CLINKER. A hard burnt paving brick, generally of small dimensions, and obtained by the calcination of a clay containing a considerable proportion of silica. Clinkers are used for the paving of stables in England; but in Holland and Belgium they are largely used even for carriage ways, and great pains are taken in their manufacture. Clinkers usually measure 7 ins. by 3 or 3½ ins. by 1½ in. So-called Dutch clinkers in England are 6 ins. by 3 ins. by 1 in.; but in Holland they are 6½ ins. by 2½ ins. by 1½ in. PAVING BRICK.

G. R. B.

CLINKER BUILT. A term applied by shipbuilders and country carpenters to planking when the edges of the boards lap: when the edges join, or butt, the work is said to be CARVEL BUILT.

40.

CLOACA, see SEWER.

CLOAK RAIL and PINS. The name given to a long thin and narrow piece of wood furnished with pins to receive articles of dress. It is generally fixed against a wall, but sometimes on a standard: in the former case it is advisable to line the wall under it with boarding, when the dresses are likely to be suspended in a damp state.

CLOCHAN (*cloch*, a stone). The name given to a class of primitive buildings peculiar to Ireland. They are of great antiquity, supposed to be dwellings of the Firbolg and Tuatha de Danann tribes, but subsequently in many instances used as cenobitic cells. Several hundreds exist in various stages of dilapidation. They are almost exclusively found on the south and west coasts, particularly in the counties of Kerry, Galway and Mayo, and very often situated upon rocky and almost inaccessible islets on the coast. The prevailing form is that of a bee-hive. The masonry is generally undressed and uncemented, and is in many instances of Cyclopean character; the walls are from 4 to 13 ft. thick, the batter commencing from the ground, each course overlaying that under it until a single stone covers the apex. Clochan na Carriage on Arran island, bay of Galway, is rectangular on plan; the internal dimensions are 19 ft. long, 7½ ft. broad,



and 8 ft. high; the walls 4 ft. thick; the doorway 3 ft. high and 2½ ft. wide. The clochan on Church island in Lough Currane, county of Kerry, is square on plan with the external angles rounded off; the internal dimensions are 16½ ft. by 15 ft.; the walls 7 ft. thick at the base and 9½ ft. high; doorway 4½ ft. high, 3 ft. wide at bottom, narrowing to 2 ft. 9 ins. at top, with a flat head formed by massive stone lintels. This is the form and proportions of the doors of this class of structures, shewing a perfect similarity to the doors of the oldest pillar towers. Clochan na Phuca on the isle of Arran is oval on plan; one on Mount Eagle in Kerry is of the form of a quarter circle; at Caherdorgan in the same county, within the area of a caher or stone fort, is a group of six, one of which is eye-shaped, or oval with sharp extremities. On Mount Eagle are a succession of from thirty to forty cahirs or stone forts, which enclose groups of from two to six clochans. These buildings are in many parts of Kerry called *bo-ens*, which would seem to connect them with cow-worship, of which there are so many evidences in the traditions and topography of Ireland. PETRIE, *Round Towers*, 2nd edit., 8vo., Dublin, 1845; WAKEMAN, *Handbook of Irish Antiquities*, 12mo., Dublin, 1848; *Unpublished Manuscripts of JOHN WINDELE*. R. R. B.

CLOCHAR (PIERRE), born at Bordeaux in 1774, was probably the son of the CLOCHARD who in 1787 built the sumptuous *moulin des Charbons* at Bordeaux. He was the pupil of David, Leroy, Regnault and Percier. His prize designs, 1801 and 1809, for laying out the site of the château Trompette at Bordeaux, and for a *palais de justice* in its place, have been engraved; chief inspector of the works at the abattoir at Montmartre, 1811-19; published *Maisons et rues d'Italie*, fol., Paris, 1815, and *Monumens et tombeaux d'Italie*, fol., Paris, 1815. He died after 1830. 110.

CLOCHARD or CLOCHER. The name properly given by French and early English writers to the steeple of a church; there may thus be a *beffroi* or bellry, i.e. bell carriage, in a *clocher*. It should be noticed that in French *beffroi* as a bell tower is limited to a secular bell tower, as that of an hôtel-de-ville (but the clocher of a church at Beaugency still retains its name, although attached to the hôtel Dieu), or of a fortress; whereas this distinction is now little regarded in England, where the word *clochard* is obsolete. Strype's *Stow, Survey*, fol., London, 1755, p. 632. DALLAWAY, *Discourses*, 8vo., London, 1833, p. 174, confounds the term and *cloghead*; he says, "clochard, bell tower, anciently an insulated dwelling." FOSBROKE, *Archæ. Dict.*, calls 'cloghead', a round tower.

CLOCK TOWER (It. *torre dell' orologio*; Sp. *torre de reloj*; Fr. *tour d'horloge*; Ger. *uhrenturm*). Although a bellry and a clock chamber generally occupy the same tower or steeple they are at times separate, as at S. Paul's in London: in Italy, as at Cremona, they are generally combined; but a separate clock tower occurs so early as 1344, at Padua, built expressly for the reception of the machine: the first public clock in Italy was placed 1306 in the tower of S. Eustorgio at Milan; MARCHESI, *Lives*, 8vo., Dublin, 1852, i, 86. The other principal clock towers of Italy are that at Venice by Pietro Lombardo to the ducal palace, 1494; at Casale, built before 1000, but altered for the purpose 1510; and at Brescia, 1522. A large number of views of French clock towers is given by NODDIER and TAYLOR, *Voy. Pitt.*, passim.

CLOCHER. The seat until 1850 of a bishopric in the county of Tyrone in Ireland. The one street has stone houses facing the park, of the bishop's palace which was repaired 1690-1716, and the close, of the cathedral burnt 1396 and rebuilt 1380-1432; WARE, *Antiq.*, fol., Dublin, 1739, i, 184.

CLOISTER (It. *chiostro*; Sp. *claustrum*; Fr. *cloître*; Ger. *Kloster*). The late Latin word *claustrum*, which meant an enclosed place, was applied generally, as cloister still is poetically in English, to a monastery or nunnery: but particularly it was used in the first place indefinitely for a court having a covered passage on one or more sides; and in the second place definitely

for that covered walk, ambulatory, or passage from one principal portion of a conventual establishment to another. The English name for the enclosed piazza, garden, or courtyard, is *cloister garth* (Fr. *préau*), sometimes used as a cemetery; while, among other purposes, the cloisters served to receive sepulchral memorials: and the general use of the word cloister in the plural by Englishmen shows that the term in the singular only means each direct line of passage. The cloisters had two distinct terms applied to them: each covered walk was called an ALLEY or deambulatory: each face towards the garth was called a FANE or *payne*, having plain or traceried openings between pillars, or piers that were frequently buttressed; in northern countries, these openings were sometimes partially glazed as at Norwich and at Salisbury, or entirely glazed as at Lacock nunnery in Wiltshire (built 1400-13), and at Gloucester; or partly closed with wooden shutters, as at Wells: each face of the alley opposite to the windows was formed by the wall of some main building, such as the chapter house and the refectory, with a BENCH TABLE only broken by the doorways necessary for communication with the buildings.

A common appendage to the cloister was a *lavatorium* or stone sink, at which the monks washed their hands previous to entering the refectory; sufficient examples of this appendage exist or existed at Norwich, Wells, Worcester (where the stone work is perforated to permit communication), etc., especially at Durham and Gloucester, at which last places the cloisters had cells or stalls for study under the windows. CARRELL. Processions from the chapter house or from the common room to the church on solemn occasions were marshalled in these walks, which were also places for exercise in hot or wet weather. Some of the most beautiful specimens of groined and fan vaulting are found in cloisters. The use of cloisters was not peculiar to monasteries: the colleges both on the continent and in England were generally provided with such walks, and one or more are frequently attached to modern educational establishments. Among the most celebrated of these remaining in England are those at Magdalen (fifteenth century) and New college (fourteenth century) at Oxford, which have oaken roofs; Trinity college at Cambridge has an arcade of the Doric order.

At old S. Paul's, and at S. Stephen's, Westminster, the cloisters were two storied in height, and were perhaps as unique in that respect in England as the double refectory and dormitory of Mont S. Michel in France; at Fountains abbey there are the remains of a double ailed cloister. It was not very usual to have more than one cloister; the principal one, indeed, was called *claustrum regulare* if there were others, as at S. Alban's, which had at least two secondary cloisters, one being three sided, the other quadrangular: but the plan of the monastery of BATALHA in Portugal shows at least four cloistered courts, and in Spain one or more courts with cloisters two or three stories in height are not uncommon, especially to the colleges. More than one cloister is not uncommon in the large monasteries of Southern Europe. At Catania in Sicily, some of the cloisters to the Benedictine monastery have a double ambulatory or corridor to secure coolness. The analogy between the basilican atrium, the Italian loggia, the arcades round the courtyards of Eastern houses, and those round the public places of Northern Europe, e.g. at the episcopal palace at Liège, and the bourse at Antwerp, must suggest itself to the attention of every student of architecture.

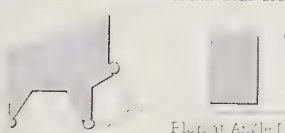
CLONFERT. The seat of an ancient bishopric, situated in the county of Galway in Ireland. John, an Italian, bishop 1266-96, is said to have repaired the church, which was again repaired in 1606-84; the episcopal palace dates 1627-43.

The cathedral consists of a nave, with a western tower, transepts, and chancel. The western entrance is formed by a slightly projecting Romanesque porch, the front of which is one mass of sculpture; its high pitched gable is terminated at the apex by a finial of three human heads. The doorway has six orders of arches; the whole surface of the arch moldings is profusely carved, and the jamb shafts are diapered all over

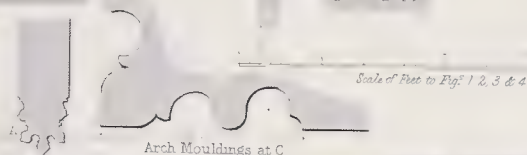
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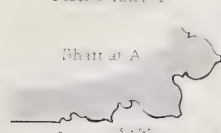
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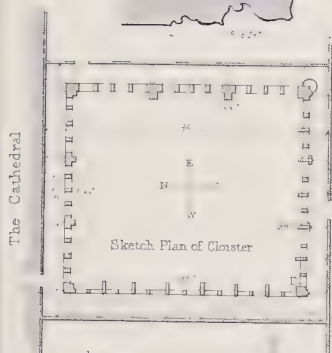
Floor at Arch I



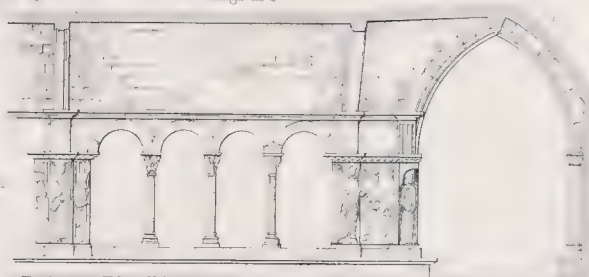
Arch Mouldings at C



Skirt at A

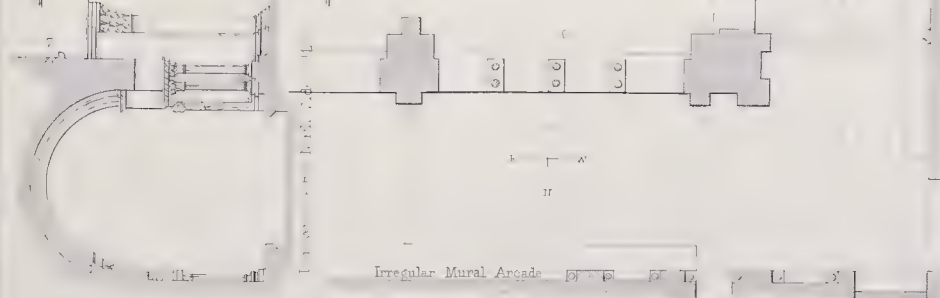


Sketch Plan of Cloister



Interior Elevation, North Side, 1120

Scale of Feet to Fig: 5, 6 & 7



Irregular Mural Arcade

T. Roger Smith, M.I.B.A. S. Trophime, ARLES

the Sixteen to F. Bedford April 30<sup>th</sup> 1858







*S<sup>a</sup> Maria dei Servi, BOLOGNA Edward Ingham M I B A*



*The Cathedral, AMALVI J. M. Lockyer M I B A*

*San Zenone, VERONA Thomas Little*





with incised ornaments of the most varied and fanciful character; on the inner jambs are two sculptured figures in antique costumes holding pastoral staffs. The plain and massive tower, of the fourteenth century, has an embattled parapet. The nave is only 54 ft. long by 27 ft. wide. The chancel arch is pointed, 12 ft. wide, the arch moldings springing from corbels of angels bearing shields, others with scrolls are carved on the jambs. The chancel is 27½ ft. long by 22 ft. wide. The east window is a couplet, each opening circular headed, 8 ft. high and 12½ ins. wide externally, splaying inwards to 7 ft. 6 ins. wide; the splays are panelled. The material of this window, a hard black marble, is exquisitely wrought, the joints scarcely perceptible; the stones vary from 8 to 16 ins. in height, and run the whole breadth of the jamb, which is 5 ft. on the splay. The quoins of the chancel have a three-quarter shaft, oval in section, a feature to be seen on a few of the churches in Ireland erected between the ninth and eleventh centuries. The west porch is given in NEWENHAM, *Pict. Antiq. of Ireland*, 4to., London, 1830; WARE, *Antiq.*, fol., Dublin, 1739, i, 537. R. R. B.

CLONMACNOISE. The seat of an ancient bishopric in King's county in Ireland. An abbey, founded 548, subsequently became episcopal, and the diocese was united to that of Meath in 1568. The following ecclesiastical ruins are situated a short distance from the banks of the river Shannon, and are surrounded by a spacious cemetery enclosed by an ancient wall, outside of which are the ruins of the episcopal palace and a nunnery. The large round tower, also called O'Rorke's tower, is now only 62 ft. high, the circumference at the base is 56 ft. The doorway is semicircular headed with imposts, the jambs converge; the thickness of the wall at the sill is 3 ft. 9 ins.; the second and third stories have each a small quadrangular window with converging sides; in the upper part are eight openings of similar form, which, together with the various classes of masonry shewing different repairs, prove that this portion is modern. The base to about half the height is built of fine close-jointed blocks of sandstone in nearly regular courses; from this to the sills of the upper windows the joints are more open and the courses quite irregular and of hammered limestone; from the sills upward the masonry is of inferior limestone rubble. The ANNALS OF THE FOUR MASTERS record the roofing of this tower 1124, and the demolition of the roof by lightning in 1135. Excavations were made in 1851 at the foundations, when two skeletons were found imbedded in the centre.

Teampuil Finghin, sometimes called McCarthy's church, is of Romanesque character; the nave can only be traced by its foundations; it was 28 ft. 10 ins. long and 14 ft. 6 ins. broad; the chancel, nearly perfect, is 8 ft. 7 ins. by 8 ft. 8 ins.; its arch is 6 ft. in the clear. PETRIE, p. 264-5, illustrates this edifice, and endeavours to establish a greater antiquity than is consistent with its architectural features. The round tower standing at the southern external angle formed by the nave and chancel, has a door opening into the latter; its entire height is 57 ft. 3 ins.; internal diameter 7 ft. at base; and the thickness of the wall 3 ft. 1 in. The conical roof, nearly perfect, is formed of rhomboidal shaped blocks, the courses overlapping and not concentric, each course laid reverse to the preceding, presenting the appearance of herringbone ashlar; the masonry is fine sandstone ashlar in regular courses from 10 to 15 ins. in height. The six windows are on the south and east sides; they are all quadrangular except one in the lowest story which is semicircular-headed; in all the sides converge, and they have a small reveal or rebate cut round the external jambs and forming an arch over the square opening, evidently an after thought. The courses of the masonry of the church and tower are not regular, proving a difference of date in their erection, and the lower part of the tower next the church has been cut away and a bonding made into it; the original doorway and the lower window have been cut away, as also the internal wall to the height of 7 ft. to make the lower story available for a sacristy when the church was erected against it.

ARCH. PUB. SOC.

Teampuil Dermot, the cathedral, is of small size, being a nave with a chapel or south transept; it is 60 ft. long by 30 ft. wide; the original fabric is of remote antiquity; the west doorway, the jambs of which only now remain, is given as it originally stood by WARE, who also illustrates the north doorway of the fifteenth century. Teampuil Righ, or the king's church, consists of a nave 44 ft. long by 16 ft. wide inside; it is Romanesque in style; its principal feature is a couplet window in the east gable with semicircular heads and good moldings. Teampuil Connor, now used as the parish church, is 37 ft. 9 ins. long by 19 ft. 4 ins. wide inside, the walls are 4 ft. thick; it is of very remote antiquity; the west doorway, still perfect, has a semicircular head springing from molded imposts, with converging sides, and built of massive blocks of sandstone; all the other portions have been modernized. Remains of four other churches exist, but have not any feature of interest; there were formerly nine churches. Also within the cemetery are three stone crosses, two of them being richly sculptured on the fronts and sides; and also a considerable number of sepulchral slabs of great antiquity, with inscriptions in the Irish character.

A nunnery founded in the twelfth century had a church, which was in existence until a few years since; a portion of the chancel arch richly sculptured now alone remains. Nearer the river are the ruins of a building apparently of the fifteenth century, said to have been an episcopal palace. WARE, *Antiquities*, fol., Dublin, 1739, and PETRIE, *Round Towers*, 8vo., Dublin, 1845, illustrate most of these antiquities; LEDWICH, *Antiquities*, 8vo., Dublin, 1804; CROMWELL, *Excursions*, Lond., 1820; NEWENHAM, *Pict. Antiq.*, 4to., Lond., 1830. R. R. B.

CLOOS or CLOSE (NICHOLAS). It is stated by HEARNE, *History, etc., of Glastonbury*, 8vo., Oxford, 1722, preface, lxxv, that "It appears, however, from their books at King's College (as I am informed by my friend Mr. Baker, the learned antiquary of Cambridge) that one Mr. Cloos (father of Nicholas Cloos, one of the first fellows of that college, and afterwards bishop of Carlisle and Lichfield) was the architect of this chapel (though GODWIN, *De Præs.*, p. 378, says the bishop himself was the master of the works here), as far as king Henry VI's share" (i. e. the white stone work, which is pretty high at the east end, but lessens or recedes gradually to the west) "reacheth, and contriver and designer of the whole." In a manuscript of the Rev. Mr. Cole in the British Museum, Add. MSS. 5814, Plut. clxxx, F. fo. 8, 9, and 5802, Plut. clxxxix, E. fo. 108, 9, and 138, is a minute biography of bishop Nicholas Close, mentioned as born at Drybeck in Westmorland, and died October 1452. BENTLEY, *Excerpta Historica*, 8vo., London, 1831, p. 364, gives the grant of arms made 1450 to the younger Cloos for his services in the building operations at the above named college.

CLOSE. The precincts of a cathedral are usually so called, whether enclosed within any clearly defined limits or not. s. s.

CLOSER, CLOSTER, or CLOSURE (Fr. *clausoir*). The stone or brick laid in any part of a course, to close the defined length of that course, being especially necessary in brickwork in order to break joint at the end of the first stretcher in the course. The brick is called a 'king closer' if three-fourths and a 'queen closer' if one-fourth of a brick in length. It is generally considered as half a heading brick. STEPHENS, in *Transactions of the Society of Arts*, etc., 8vo., London, 1812, calls each half of a brick cut longitudinally, i. e. made  $9 \times 2\frac{1}{2} \times 3$  a 'king closer', and half of each portion a 'common closer'. BAT.

CLOSE STRING STAIRS. The name given to stairs when steps are housed into strings instead of the strings being cut to the steps.

CLOSET. A word used in English in several senses: as a CABINET or private audience chamber, ANTECLOSET; as a private oratory; as a dressing room or any other small and very private apartment communicating in general with a large room; or as a closed place, however small, in which anything can be deposited. As cupboards, closets, when properly fitted up, and of a sufficient depth to be useful (that is, when the shelves are

F. E.



12 ins. deep), are a very great convenience. When they are put up, independently of the plastering, they should be lined all round with deal, and made air and dust tight. If it can be avoided, closets should never be placed against an external wall, on account of the damp, unless the wall is battened; *BUILDER Journal*, 1843, i, 567. The introduction of closets was esteemed at the beginning of the eighteenth century as one of the great recent improvements in building; at the beginning of the nineteenth century it became a mark of bad taste to provide them.

**CLOUT NAIL.** A flat headed nail with which iron work is usually fastened to wood. 4.

**CLOVE BROWN.** A brown colour with red and a little blue in it, of which axinite is taken as a standard by ANSTED, *Elementary Course*, 8vo., London, 1850.

**CLOYNE** (in Irish, Cluain-Uamha, the vale of caves). The seat of a bishopric in the county of Cork in Ireland; it was united in 1835 to those of Cork and Ross. The cathedral, standing in a spacious cemetery, was erected about the middle of the thirteenth century in the First Pointed style, and possesses traces of the succeeding styles. The nave, modernized about 1650, is 76 ft. long and 23 ft. 7 ins. wide; the aisles are 13 ft. wide; the transept is 100 ft. long and 22 ft. wide. The chancel, including the choir, is 84 ft. long and as wide as the nave; the sacristy, at the north side, measures 27 ft. by 17 ft. The west doorway, which was enriched with elaborate moldings and shafts having foliated caps, was about 1855 injured and covered with cement. The east window of five lights is in the Second Pointed style, with flowing and rather flamboyant tracery. Externally the bold labels have sculptured heads at the apex and terminations. The ancient fittings have been replaced by modern work. The original dressings are of Caen stone. The round tower, standing near the west end of the cathedral, is called *giolcach*, also *fause an ene*, 'the growth of one night'; its height to the top of the battlement (put up in 1749, when the original conical roof was shattered by lightning) is 100 ft. 2½ ins., the internal diameter at the door sill 9 ft. 2 ins., the corresponding thickness of wall 3 ft. 8 ins., the diameter on the top floor 7 ft. 2 ins., and the thickness of the wall there 2 ft. 9½ ins. The external face of the wall has a batter of one in forty-four. There are seven offsets in the interior of the tower, varying in height; first 11 ft. 11½ ins., second 12 ft. 10 ins., third 12 ft. 1 in., fourth 12 ft. 3 ins., fifth 12 ft. 7 ins., sixth 11 ft. 9 ins., seventh 6 ft. 0 ins. The quadrangular doorway with converging sides and a massive stone lintel faces the east; it is 5 ft. high, 2 ft. 1 in. wide at the sill, 1 ft. 10½ ins. at the lintel, the sill is 11 ft. 9 ins. from the ground. In the upper story are four quadrangular windows, 3 ft. 8 ins. high, 1 ft. 6 ins. wide at sill, 1 ft. 2 ins. wide at lintel, facing the cardinal points; in the lower stories are three of smaller dimensions, two facing the south, and one facing the north; one facing the west having a triangular head, and one over the doorway, which is semicircular headed outside, triangular headed inside, and of larger dimensions than the preceding are in the fifth story; all these have as usual converging sides. The masonry of this tower is of hammer-dressed rubble, formed of a brown clay slate found in the neighbourhood. The dressings of the door and windows are of sandstone chiselled, so closely set that the thinnest blade of a penknife cannot be inserted between the joints. The tower is at present used as a belfry, and has wooden floors with ladders for ascent to the platform. In the cemetery are the ruined walls of a rectangular building 30 ft. by 19 ft., called S. Collman's chapel, and traditionally known as the 'fire house', and supposed, like that at Kildare, to have had some connexion with the fire worship once prevalent in Ireland. There are no other buildings worthy of notice.

At Carrig-a-crumph, near Cloyne, are extensive quarries of limestone, from which materials of any scantling can be procured; some of the beds produce a fine dove-coloured marble, which bears a fine polish and is suitable for decorative purposes; this quarry is within two miles of water carriage.

WINDLE, *Notices*, 8vo., Cork, 1842; CROKER, *Researches*, 4to., London, 1824; WARE, *Antiquities*, fol., Dublin, 1789; WILKINSON, *Practical Geology*, 8vo., London, 1845; ARCHDALE, *Mon. Hib.*, 4to., Dublin, 1796.

R. R. B.

CLUATius was employed B.C. 46 to design the monument to Tullia daughter of CICERO; *Epist. ad Att.*, xii, 18 and 36.

**CLUB HOUSE.** A structure occupied by an association, formed for the ostensible purpose of eating, drinking, reading, writing, and conversation, within the walls of the establishment. Of course professional, political, or other sympathies form the ground of association. On the continent the CASINO is the establishment which most resembles the club house, except where the British have imported their own customs; thus the factory houses in many ports are club houses, such as that at Oporto in Portugal. One or more clubs of architects appear to have quietly existed in London under two or three names, for longer or shorter periods between the year 1791 and the present day, of which those of the Palladians and the Surveyors now alone exist.

A list of the sizes of apartments in various London club houses, is given in the *BUILDER Journal*, 1847, v, 227; and further detail with plans in WEALE, *Pict. Handbook of London*, 8vo., 1851. The full complement of a club house establishment consists of, in the basement the kitchen, with all its necessary dependencies of larders, pantries, storerooms, and cellars; one or more servants' halls, rooms for the clerk of the kitchen, butler, chef, and principal domestics; and in a mezzanine is generally obtained the habitations for the domestic and official part of the establishment, with baths and dressing rooms: on the ground floor are the entrance vestibule, principal hall, desk for hall porter, morning room, coffee room, strangers' coffee or dining room, the house dining room, and a waiting room: on the principal floor are the evening or drawing room, card room, library, writing room, committee room, and secretary's room: on the upper floor are the billiard and smoking rooms with conveniences attached, and the servants' dormitories. A grand staircase and two or more of a secondary character are essential. The Reform clubhouse has an additional story appropriated exclusively to sets of chambers or lodgings, having also a separate entrance and staircase; which extra accommodation is quite peculiar to that club.

**CLUNCH.** A white limestone, or hard chalk, extensively used in some of the English cathedrals and churches of the middle ages. It is readily worked into delicate carving, moldings, and tracery, and retains its arrises with crispness; but is suited only for interior situations, as it is absorbent and soon perishes under the alternate influences of rain and frost. Although crystalline, in its general qualities and appearance it much resembles Caen stone, which is an oolite, but it is of a slightly bluer tint. The principal quarries are at Tottenhoe in Bedfordshire (used at S. Alban's abbey); at Haslingfield and at Burwell in Cambridgeshire (used at Ely, Peterborough, etc.)

This clunch must not be confounded with a portion of the middle oolitic formation, the Oxford clay, formerly called clunch clay; or with an indurated clay which divides the beds of coal, and provincially called clunch. CARD.

R. R. B.

In France a great deal of similar stone is used, and protected from the weather by various cements, in which case it answers tolerably well as a building material.

A. A.

**CLUNCH LIME.** The lime obtained from the chalk marls or the lower beds of chalk, is known in Sussex and in Cambridgeshire by the name of clunch lime. It corresponds with the stone lime of Dorking in its mineral and mechanical properties, and may be ranked amongst the moderately hydraulic varieties; the chalk from which it is obtained containing about 6 or 7 per cent. of the silicate of alumina. SMEATON, *Eddystone Lighthouse*, fol., London, 1813.

G. R. B.

CLUNIAC BUILDINGS, see BENEDICTINE BUILDINGS.

CLUNY. A celebrated abbey situated in the department of Saône et Loire in France. It was founded 912, and destroyed

1789. A new cloister was constructed by abbot Odilo, which he decorated with columns brought down the Durance and the Rhone; he died 1049, and his successor S. Hugues began 1089 the church, the largest of its time in Western Europe. The plan, a Lorraine cross like Salisbury cathedral, with five circular absidal chapels to a circular *chevet*, is ascribed to the monk Gauzon or Gunzo, formerly abbot of Baume. The church, consecrated 1131 by pope Innocent II, was finished by the monk Hezelon of Liège, with funds largely contributed by the kings of Spain and England. The choir without the *rond point* was equal in length to six bays of the nave, but was crossed by a transept in the middle; the second transept was 183 ft. long by 24 ft. wide; the choir had five aisles like the nave, which was 123 ft. wide, and was preceded by a narthex or vestibule, finished 1220, 123 ft. long by 53 ft. wide, and in front of which were two towers; the total internal length appears to have been 554 ft. according to RAMÉZ, *Histoire*, 12mo., Paris, 1843, pp. 142, 171. Three bell towers surmounted the first transept, and one was placed over the middle of the second transept. The plan of the abbey buildings is given by VIOLETTÉ LE DUC, *Dict.*, s.v. Architecture, pp. 125 and 258, who adds that the refectory was 109 ft. long by 65 ft. wide, with six rows of tables, and at one end a painting of the Last Judgment. LORAIN, *Essai Hist.*, 8vo., Dijon, 1839; CUCHÉROT, *Cluny au Onzième Siècle*; SOMMERARD, *Album*, series i, pl. 3; LENOIR, *Musée des Monuments*; and nearly all the works published before 1790 which illustrate France generally.

CLUSIUM in Tuscany, see CHIUSI.

CLUSTERED. The term employed to indicate the connexion of two or more similar architectural features, so that the whole contour is not developed. There is a difference, which should be carefully observed, between clustering and grouping, which last is often merely a species of ACCOUPLEMENT: for example, when their shafts are not engaged, columns may be grouped round a central space pier or pillar, but if the shafts of columns are engaged, either with a central pier or pillar, or among themselves, as at the corner of the Chiericato palace at Vicenza by Palladio, the columns are to be called clustered or insulated. CANTONED. 1.

CNIDOS. A city in Caria. The ruins afford valuable aid in illustrating the arrangements of a Greek city. Having chiefly occupied the side of a steep hill, the city was almost entirely seated upon terraces, one of which about 400 ft. long must have supported a stoa consisting of forty Doric columns 3 ft. in diameter, with an entrance through a hexastyle portico at each end. This stoa is almost precisely similar in size and proportions to the portico of Philip in the island of Delos, and is probably very nearly coeval with it, according to the DILETTANTI SOCIETY, *Ionian Antiquities*, fol., London, 1840, iii, which largely illustrates the remains, with some unusual details of ornament. These consist of a small theatre, with seats still perfect, of white marble, the portico behind the scene being 194 ft. wide: a small tetrastyle temple in antis, with Corinthian columns 2 ft. in diameter with twenty flutes; a principal theatre nearly perfect, with many stones 10 ft. long; the scena is about 400 ft. wide: a second small theatre, with seats placed on brick arches having a corridor beneath them round the theatre: an agora with Doric columns, having a fountain in the centre of it, and numerous other vestiges. Amongst the most interesting ruins was a building 190 ft. long and 90 ft. wide, called a bath, with an entrance not in the centre; this entrance, 33 ft. wide, had two columns in antis of a Roman Ionic order 1 ft. 10 ins. in diameter; these were unfluted, but the preliminary lines were visible; it was destroyed soon after the measurements were taken. The varieties of tint in the large-grained marble were concealed "in the ceiling by a coating of fine light ochreous colour with a stripe of ultramarine on the soffits of the beams, while the red still remaining within the more sunken recesses of the compartments was probably intended to relieve a circle or coronet of gold, which with leaves

of myrtle adorned each division of the lacunaria." The tanks were circular or pear-shaped. A plan of the city is also given by TEXIER, *Desc. de l'Asie Mineure*, fol., Paris, 1839, who, iii, p. 171, pl. 159-164, gives an exedra, HIERON, and enclosure for funeral rites in the necropolis, and the partly *pseud-isodorous* city walls; mentions the round tower *à bossage* as one of the finest specimens of Greek construction; some brick vaults for galleys in the little harbour (and a fine jetty described in RENNIE, *Harbours*, fol., Lond., 1854); numerous cippi and altars; the fact of the theatre nearest the shore being enclosed by a square wall instead of showing its exterior curvature; and states that the remains here and at APERLÆ illustrated by him show that PELASGIC CONSTRUCTION, as it is called, was in use in Asia even under the Roman dominion, for there were no city walls (in which it occurs) at the end of the Peloponnesian war, B.C. 412, THUCYDIDES, iii, 15. In the necropolis is a tomb having a site of 120 ft. square with a wall of beautiful polygonal work and a coping of flat slabs: all the interiors are either arched vaults (of which two sketches made by Mr. Page were given in 1845 to the Institution of Civil Engineers, *BUILDER Journal*, iii, 312), or narrow passages covered with flat stones; the vaults being either formed of large Cyclopean uncemented blocks, or of small stones firmly cemented together. This existence of Cyclopean masonry with regular arches has led to doubts upon the early disuse of polygonal work, well expressed by HAMILTON, *Researches*, 8vo., London, 1842, ii, 39.

COACH HOUSE (It. *rimessa*; Sp. *cochéra*; Fr. *remise*; Ger. *kutschen-haus*, *kutschen-schoppen*). A building or portion of a building in which carriages are kept. The points to which attention is chiefly necessary in the construction of a coach house, are complete dryness; perfect circulation of air; wheel boards to prevent damage from the vehicles being run against the walls; wheel tracks of stout plank to run on; and sufficient space between these boards and the walls to allow a man to walk round and between the vehicles, if there be more than one. According to the present size of carriages, the least that ought to be given for a good double coach house, is a doorway 3 ft. wide placed between the posts of the coach gates, which should be 8 ft. wide and 9 ft. high for each file of carriages, entering a room 16 ft. deep; the width of a carriage is seldom more than 6 ft. 9 ins. from out to out of the roller bolts.

COACH SCREW. An iron screw used by carpenters and coachmakers; it has a square projecting head, and is screwed in without the nut, being used where the nut cannot be fixed. G. R. N.

COAK. A term applied to a wood pin.

COAK (.....), 1789-93, erected the gaol at Stafford, which has about a hundred and fifty distinct cells for prisoners.

COAL CELLAR (Fr. *charbonnier*; Ger. *kohlen-haus*). The place in which coals for immediate consumption are kept.

	Lbs. per ft. cube.	Cube ft. per ton.
Scotch coal is said to weigh (when solid) about	81	requires 27½
Newcastle .....	79½	" 28½
Staffordshire and Cannel .....	77½	" 29

Government makes contracts for the stowage of coals in vessels at 48 cubic ft. per ton; and according to the size of the coal when broken up, from 40 to 50 cubic ft. will hold a ton in a private cellar; a chaldron of coke, which is generally supposed to weigh about 14 cwt., requires 112 cubic ft. of space, depending more on the shape than on the weight of the coke. Coal loses by the process of coking from one-fourth to one-fifth in weight, while it gains about one-fourth in bulk.

COAL EXCHANGE. A building erected for the assembling of merchants, factors, and meters, to transact the business relating to the sale and delivery of large quantities of coals. The only edifice specially erected for this purpose is probably that in Thames-street, London, commenced 1847 from the design of J. B. Bunning, and completed by him in 1849, at a cost of about £40,000. It contains an area of about 4,000 square feet, including a circular hall 60 ft. in diameter and about 70 ft. high from the floor; its glazed vault is constructed with cast



iron ribs, standing on four ranges of cast iron stanchions forming as many stories of offices, the upper ones opening into galleries round the hall. Views are given in the *BUILDER Journal*, 1847, v, 566, and 1849, vii, 462, and in the *BAUZEITUNG*, 2nd series, 347.

**COARSE STUFF.** A material prepared in different ways, determined by the quality of the materials. When obtained from chalk or limestone of a weak nature, it is screened and prepared similar to common mortar, with the addition of hair. The safest mode of preparing coarse stuff when the lime is of a strong nature, is to mix the lime after having been well slacked with a proper proportion of water, and run it through a sieve with apertures not exceeding a quarter of an inch, into a receptacle about 18 ins. deep, when the hair and sand must be added, the whole being well incorporated with a drag or three-pronged rake. When sufficiently set the water may be run off, and the stuff can be taken out and made fit for use. This composition is used for the first or pricking-up coat, and for the floating coat of ceilings and walls; also for moldings and cornices which require much stuff, in which case it is mixed with plaster of Paris. **FINE STUFF. PLASTERING.** H. B. G.

**GWILT, Encyc.**, adds that coarse stuff is also used in the floating coat, in which more hair is used than in the pricking-up coat.

The mortar used for bedding stone or brickwork is likewise called *coarse stuff*, in contradistinction to the more carefully prepared and purer lime used for pointing up the joints of masonry. G. R. B.

**COASSATIO.** The Latin general term for any junction of boards, is used by *VITRUVIUS*, vi, 6, for the flooring of a room.

**COAT (Fr. couche; Ger. grund lage).** Any thickness or covering of plasterers', painters', gilders', bronzers', or varnishers' work, done at one time. 5. 25.

**COATING.** The collective number of the coats described in the preceding article, when several are applied one after another as quickly as the work will permit: thus three or four coats of paint and two of varnish form one coating. The term is also applied to work of which one coat only is wanted. *VIOLETT, Dict.*, shows, *s. v. chape*, that one or more coats of cement, mortar, or plastering was laid on the extrados of every mediæval vault, and was called *chape* (Ger. *ueberschutt*), terms still used in engineering works. 5. 25.

**COBALT**, which occurs in nature in combination with arsenic, and also with the addition of sulphur, was first obtained in a metallic state about 1733, having the density 8.5 and being brittle, rather more fusible than iron, and reddish grey in colour. No other colouring matter is so permanent or so intense as the protoxide of cobalt, which has the property of giving a blue colour to glass. Chloride of cobalt is red, but when highly concentrated is an intense blue, the addition of nickel gives a green: the arsenate has a peach blossom colour, and is insoluble in water; the nitrate is reddish; the phosphate has a deep violet-blue, insoluble in water, and when dried in the air is a fine blue, and when calcined is a violet-black.

**COBALT BLUE.** A pigment, also called *AZURE*, *PARIS BLUE*, *ULTRAMARINE*, and *VIENNA BLUE*, obtained by mixing a salt of pure cobalt with pure alum, precipitated by an alkaline carbonate, or the phosphate of cobalt mixed with pure alumina. The results very nearly resemble *Thénard's blue*, which is also called *cobalt*, being phosphate of cobalt with arsenate of cobalt, mixed with alum. These varieties form a cobalt blue that may be called a blue-lake, which resists the action of strong light, although impure air greens and finally blackens it; cobalt blue dries well in oil, and combines with other pigments. 9.

**COBALT BLUES.** When the ore of cobalt is calcined and mixed with quartzose sand in a mill, the result is called *saffre*, *saffer*, *zaffer*, or *zaffre*, and enamel blue; *zaffer* melted with a fritti carbonate of potash is called *smalt*, the ancient *ύαλος*, *hyalos*, *DAVY*, in *Phil. Trans.*, 1815, p. 108; and *smalt* when reduced to an impalpable powder is technically known as *azure*; it then is divided by levigation into four classes; viz. *azure* or

coarse blue (Fr. *gros-bleu*, Ger. *streu-blau*); blue (Fr. *couleur*, Ger. *farbe*); pale blue or blue sand (Fr. and Ger. *eschel*); and ashes (Fr. *boues*, Ger. *sumpfeschel*). The different varieties of each class are known in the trade by letters, thus c, oc, mc, fc, ffc, fffc, ffffc, respectively mean *couleur*, ordinary (colour), medium, fine, etc.; but from a mistake mention is sometimes made of cobalt of four *fires* instead of four *finés*. These different varieties of each class in one factory differ in colour from those produced by another factory, or even in the same factory at different times; in consequence, trade lists are filled with various names of such cobalt blues, amongst which the most prominent are *azure*, *Dumont's blue* (the finest, and employed in water colours), *Dutch ultramarine*, *Hungarian blue*, *powder blue*, *royal blue*, and *smalt*. Almost all these cobalt blues are more or less affected by shade, damp, or impure air, and it is said that light and oxygen affect them in some degree, i. e. that almost all cobalt blues when ground in oil acquire in a few months a greenish tint. 9.

**COBALT GREEN.** There are two pigments of this denomination; one an original pigment prepared immediately from cobalt (probably the same as Rinnmann's green, which is the result of combining oxides of cobalt and zinc, or one part of sulphate of cobalt with three parts of sulphate of zinc, dissolving them and precipitating with carbonate of soda); the precipitate, when washed, dried, and calcined, is a pure but not very powerful green colour, that has none of the faults of the cobalt blues, is durable both in water and oil, and dries well in the latter; the other is a mixture of a chrome yellow with a cobalt blue, and of course has all the defects of its component colours. 9.

**COBARRUBIAS**, see *COVARRUBIAS* (ALONSO).

**COBBLES.** "Large round stones in the beds of rivers, brought down by floods from the mountains. Houses are built with them" in the West Riding of Yorkshire and other counties; *ARCHÆOLOGIA*, xvii, 142.

**COBHAM (VISCOUNT).** The original house at Stowe near Buckingham is said to have been designed by him; and the additions, comprising the stately south front, by the first lord Camelford, for Richard earl Temple, 1775: *CIVIL ENGINEER Journal*, xi, 258. BORRA.

**COB IRON (Fr. chenot),** or **FIREDOG**, see *ANDIRON*.

**COB WALLING (Fr. torchis, Ger. kleiber lehm,** clay without gravel mixed with chopped straw; Fr. *bauge*, Ger. *stroh-lehm*, clay without sand pebbles or gravel mixed with straw (Fr. *paille*) and hay, used in villages to build the walls of houses; Fr. *bousillage*, reeds (Fr. *chaume*) and tempered clay, commonly worked in Basse Bretagne; clay and mud, or mud alone; none of these appear to have been the Roman *FORMARIUM OPUS*, nor the Fr. *pisé*, Ger. *stampferde*, materials rammed in moulds). A wall made of unburnt clay intermixed with chopped straw, and occasionally layers of long straw, which act as bond. This description of walls is still used in the agricultural districts of the west of England, especially Devonshire, Somersetshire, and South Wiltshire; and when precautions are taken to raise them from immediate contact with the ground, and to protect their surfaces by projecting roofs, they make very warm, dry houses; but they require to be very thick, and do not resist any great crushing weight. The openings for doors, windows, etc., are made with stone or wood lintels; and the plinths, fire places, chimnies, etc., are executed in brick or stone work: usually these walls are lime-whited, both externally and internally. **PISÉ. CLAY WALLING.**

Cob walls are now much used in the poorer districts of Europe, Asia, the backwoods of America and New Zealand; because the materials are very generally distributed, and their construction does not require much skill. G. R. B.

In making cob walls 2 ft. wide, the quantity of materials to build a perch of work, that is to say, 18 ft. long, 1 ft. high, and 2 ft. wide, is two loads of clay and one load of coarse shilf (broken slate in small pieces such as is used for mending roads in parts of

Cornwall) mixed and wetted, and trodden together to lump just the same as clay for brick before it is put into the mold: to this is added three bundles of barley straw, well treaded into the above mixture of clay and shilf; this is built on a stone wall, about 6 ins. at a time, treading every layer well down and solid; it is put on in a moist state by means of shovels, so that a course can hardly be raised more than 12 or 18 ins. in height at a time without risk of bulging, and then it must be left for some time to dry and to become consolidated before a second course can be placed upon it; and when the whole wall is built up it must be pared down to make the surfaces true and even. The stone wall under the cob ought to be 2 ft. in height from the foundation, to keep the damp from off the cob. The cob wall should project over the stone wall about 1½ in. If the weather is dry about 5 ft. in height can be built, then it may rest about three weeks, till the wall has got dry enough to build on again; then 5 ft. more on the top if required: *ECCLESIOLOGIST Journal*, 1848, ix, 217, 288.

FORD in the *Quarterly Review* for April 1837, p. 528, has in a very interesting manner traced the use of cob walling from the earliest times: quoting from LONDON, *Encyc. of Cottage Architecture*, § 839, whose information was furnished by the Rev. W. T. E. (Ellacombe?) who had himself built several houses of two stories with cob walls, and who stated that he was himself born in a cob walled parsonage built in the reign of Elizabeth or earlier, and only taken down in 1831 to be rebuilt.

The cob walls of the West of England are composed of earth and straw mixed up with water like mortar and well beaten and trodden together, the earth nearest at hand is generally used, but the more loamy is the more suitable. The walls are made 2 ft. thick and are raised upon a foundation, the higher the better, of masonry. The raise or rise is from 3 to 5 ft., the next not so high, while every following raise diminishes in height. It is usual to pare down the sides of each successive raise in its turn before the next follows; for this purpose an iron copparer is used, resembling a baker's peel. The lintels of the doors, windows, cupboards, etc., must be bedded on cross pieces as the work advances, with allowance for their settlement. The openings are cut out after the work has well settled. One man stands on the wall to receive, arrange, and tread the cob, which is thrown up to him by another with a fork of two or three prongs. As frost is prejudicial the walls are temporarily thatched, if the roof of thatch is not on before winter: this is generally superior to most English thatching, being done with combed wheatstraw called *reed*, consisting of stiff unbruised and unbroken stalks separated from the fodder straw and bound up in large sheaves called "nitches." The outer walls are plastered in the following spring and finished with a coat of roughcast, locally called *slap-dash*. Instead of brick nogging for partitions, cob is used for filling in the framework, which is previously lathed with stout slit oak or hazel, and this sort of work is called *rad and dab*. Cob walls thatched are very common for garden boundaries, but require frequent repairs to their plastered faces. Cobwork costs about three times less than stone and five times less than brickwork in the localities above mentioned; but a house of two stories in cob work should not be built in less than two years.

A somewhat similar practice called "dry cob" is preferred in Devonshire to wet cob, as there is less settling.

Wattle and dab is another local expression for work in partitions resembling *rad and dab*.

COCCAPANI (GIOVANNI), not COCCOPANI as in MILIZIA, born 10 May 1582 at Florence, belonged to an illustrious family, and appears to have been an amateur practising law, history, science, and the fine arts. He was invited 1622 to Vienna as a military engineer, and was rewarded with some fiefs. On his return he designed 1627 the church on the hill called il Poggio, near Volterra, executed probably by his pupil Lodovico Incontri, and 1628 the convent with its hexagonal church of Sta. Teresa di Gesù at Florence. He died 1619, professor of ma-

ARCH. PUB. SOC.

thematics at Florence, having refused a similar post at Rome, and was buried in the family tomb at Sta. Maria Maggiore. MILIZIA attributes to him the villa called Palazzo Imperiale near Florence. His brother Sigismondo, born 10 August 1583, a pupil of Lodovico Cardi da Cigoli, gave attention to the same studies, and made 1634 a competition design of three orders in height for the front of Sta. Maria del Fiore, built and painted 1638 in competition against two Roman architects two chapels in the duomo at Siena, wrote on architecture, and died 23 March 1642. 3, 12, 29, 30, 32.

COCCEIUS AUCTUS (LUCIUS) is known by the inscription L. Cocceius L. C. Posthumi L. Auctus Architect., to have designed the temple of a Corinthian order built of white marble and now the cathedral church of S. Procolo at Pozzuoli, which formerly (1696) showed by another inscription that L. Calpurnius L. F. templum Augusto cum ornamentis D. D. When Agrippa constructed the portus Julius he employed an architect named Cocceius to form two tunnels, one from Cumæ to the lacus Avernus; the other, now called grotta della Sibella, from that lake to Baia, or rather to the lacus Lucrinus. The tunnel, now called *grotta di Seiano* or *di Posilipo*, near the punta di Coroglio opposite the island of Nisita is also to be attributed to Cocceius and is not to be mistaken for the tunnel nearer Naples called also the grotta di Posilipo or di Pozzuoli. CAPACCI, *Hist. Neap.*, 4to., Naples, 1771, ii, 324; STRABO, v; GRUTER, *Corp. Inscr.*, fol., Amsterdam, 1707, pp. 227, 382, 623. 28.

COCCODES. The name given to a freestone consisting of grains rather larger than those of ammite, and consequently than those of any other oolitic stone. 13.

COCCOLOBA uvifera, sea side grape or mangrove grape. A tree of Jamaica and the West Indies, producing a hard, tough, durable, and beautiful wood, of a large size, used in cabinet work; it is light in weight and of a white, but sometimes stated to be reddish, colour. In appearance it comes near to the greenheart or cogwood. C. latifolia, a West Indian tree is called IRON WOOD. HOLTZAPFEL, *Woods*. 71.

COCHERY (.....) was admitted into the Academy of Architecture in Paris in 1699.

COCHET (CLAUDE), born 1761 at Lyon, was a pupil of Dugonze and entered 1783 the Academy of Architecture at Paris. He obtained prizes 1786 from the Academy at Parma, 1795 for the temple pour les assemblées primaires, and 1799 for the national and departmental columns. In 1800 he was commissioned to transform the church of the Jesuits at Lyon, into the hall for the sittings of the assembly of the Cisalpine States, and with the restoration of the hotel-de-ville at Rouen. He built the masonic lodge in the Brotteaux at Lyon; published his design for the monument erected under him at the same place to those who fell in the siege of Lyon, 1814; as well as several essays enumerated by QUÉRARD. He was then appointed professor of architecture in the School of Fine Arts at Lyon, but resigned 1824. He died after 1831. 110.

COCHLEA (in late Latin *cochleare*, *cogla*). This word generally translated 'cockle' has several meanings. As a kind of doorway and door, resembling a turntable or as it was formerly called a turnpike, suitable to an aviary, a bull ring, etc., VARRO, *R.R.*, iii, 5, when it was desirable that the prisoner should not escape when the gaoler entered or quitted the place of confinement, it probably altogether resembled the wheel (It. *ruota*, Fr. *roue*), common in foreign asylums and monastic establishments, which is a cylindrical box revolving on a perpendicular axis in the thickness of the wall; an opening in the outside admits the article to be passed into a space left in the box, and being turned half round the box presents the object to a corresponding hole on the inside. The word is used by ISIDORUS, *Origines*, xv, 2, for a corkscrew staircase turret; and by DURANDUS, *Rationale*, i, 37, for a winding secret passage within the thickness of a wall.

COCHLEARIUM. A place for the confinement of snails of those species which were esteemed by the Romans as viands

F F



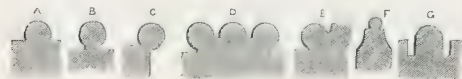
or as medicines: it was simply a shady place kept moist, and neither covered nor walled, but merely enclosed by a ditch. The first ever formed in Italy was that at Tarquinii by Fulvius Hirpinus, a short time before the civil war between Cæsar and Pompey. VARRO, iii, 14; PLINY, *H. N.*, ix, 56, xxx, 7; SALLUST, *Jugur.* 93.

COCHRANE (THOMAS OF), created earl of Mar by king James III of Scotland, to whom he was master of the works. In 1482 he was arrested at Lauder church in Berwickshire by the nobles, who were indignant that "a mason" as they called him, should be so raised as their equal, and hung him over the bridge. *BUILDER Journal*, ix, 53. W. R. C.

COCK. An instrument placed at the end or in the middle of a pipe, having a perforated plug for the purpose of stopping the flow of the fluid when required. There are various kinds, as BALL COCK or BALL VALVE, BIB COCK, FOURWAY COCK, STOP COCK, TAP, VALVE COCK, each made according to the fancy of the inventor. A long article is given in the PENNY CYCLOPÆDIA, suppl. vol.

COCKADE. The name given in Norfolk to a grating over a gully hole. J. J. S.

COCK BEAD or COCKED BEAD. The name given to a BEAD which projects on both sides, as A and B, from the surface of the work to which it belongs: if it occurs at the corner of angular work, as C, it is a return cock bead. Two or more cock beads conjoined may form a REEDING, as D. The term



ASTRAGAL appears to have been applied to a bead cocked on one side only, as E, but is now chiefly used for a cock bead which has little or no ground on one or each side of it, as F. Quirked cock beads are sometimes very effective, especially, as at G, in marble work.

COCKERELL (SAMUEL PEPPYS), born about 1754 was a pupil of Sir Robert Taylor, contemporarily with Messrs. Craig, Leach, Nash, and others. The most prominent of his works were 1785 the entrance and the bridge for W. Byam Martin, esq., in the park at Whiteknights, Berkshire; 1792 a town residence; improvements at the Foundling Hospital estate; the church then building at Banbury in Oxfordshire; a marine cottage built in the Isle of Thanet; 1793, decoration of church in Normanton Park for Sir G. Heathcote, bart.; Middleton Hall, Carmarthenshire, then building for Sir Wm. Paxton (given in NEALE, *Seats*, v, and by RICHARDSON, *Vit. Brit.*, fol., London, 1802, ii, pl. 62-4), with the note that the projections are of Bath stone; a lofty tower at north end of the park as a prospect house and monument to Lord Nelson, was also there erected by him; its design has been much admired and considered a type of this kind of monument, the plan is triangular below, having three circular towers at the angles, and is hexagonal at the top; 1795, principal front of Gore Court near Sittingbourne, Kent, also given by RICHARDSON, i, pl. 11, having a tetrastyle in antis portico of the Ionic order; the description states that the columns, balustrades, and other decorations, are of a *pierre-de-liais* or freestone from the environs of Paris; 1797, east front of S. Martin's Outwich, then building; 1798, interior view of that edifice; 1799, east end of S. Margaret's church, Westminster; 1801, entrance to Buckland Abbey, Devonshire, for Lord Heathfield, as a sea-mark and monument to Sir Francis Drake; entrance to the stables of the Light Horse Volunteers in Worship Street, London; a corps-de-garde near S. James's, dated 1790; the new tower to be built to the church of S. Ann, Soho; the interior of S. Margaret's church, as then executing with new roof, ceiling, galleries and organ; 1802, Nutwell Court, near Exeter, for Lord Heathfield; 1803, a church at Huntingdon adapted to the old tower, etc.; and a town hall and market house in

Cheshire. He also designed the house called Pierremont S. Peters, in the Isle of Thanet, for Mr. Forsyth; and the two brick houses, now Nos. 144 and 145, Piccadilly. He was appointed to examine and report upon the failure of the floor in the rooms of the Royal Academy of Arts at Somerset House; and was referred to in a great variety of public works. He was surveyor to the Foundling Hospital, the sees of Canterbury and London, the Pulteney and other estates, the East India Company, for many years erecting many large warehouses, and to the Board of Admiralty, for which he built the official residence of the First Lord. His pupils were Joseph Kay; Latrobe, who built the capitol at Washington, U.S.; W. Porden; C. H. Tatham; Thomas Martyn; his son, C. R. Cockerell, R.A.; and others. He died 12 July, 1827. C. R. C.

COCKET CENTRE. A name given to the centring of an arch, where the level tie beam is omitted so as to leave head room in the centre above the springing of the arch. CENTRE.

COCKEY. A provincial term for a common sewer; PARKIN, *History of Norwich*, 8vo., Lynn, 1783, p. 239.

COCKING or COGGING, see CAULKING and DOVETAIL.

COCKLE or WINDING STAIRS (Fr. *escalier à vis*), see COCHLEA.

COCKLE, COKEL, or COAKEL. The name given to a vessel of cast iron, formerly much used for the purpose of heating and drying in large buildings, where it is often worked at nearly a red heat, to its own destruction as well as to the danger of the building.

COCK LOFT or COT LOFT (Fr. *galetas, grenier*). The name given to the interior of the roof, above the topmost ceiling of a house, which is generally used for lumber, but in that case should have rough flooring.

COCKSPUR. A term used at the beginning of the last century in speaking of wrought iron casements "made with turnbouts (or turnbuckles as some call them) or cockspurs, and pull backs at the hind side to pull them back." 4.

COCOA, COCUS, or KOKRA WOOD, see LEPIDOSTACHYS.

COCOBOLO. The native name of African BLACK WOOD.

COCOS NUCIFERA, cocoa nut palm. A native of the East and West Indies, sometimes growing to a height of 90 ft. and to a diameter of 3 ft. No part of the tree is without its service to the Indian. The wood of the lower portion of the trunk is used for joists, troughs for water, and for general carpentry, etc.; its fibres are of a chestnut brown, and several shades darker than the intermediate substance. *C. niepere*, black palm tree, the fibres of which are nearly black and quite straight; *C. guianensis*, prickly brown palm tree, and red brown palm tree, are used for turning and in cabinet work. The root of the cocoa nut tree (Prince of Wales Island) is used for cabinet work. 71.

COCUS WOOD of commerce, see AMERIMNUM.

COEBERGER (WENCESLAUS DE), also called CORBERGER, COBERGER, CUOBERGER, KABERGER, KOEBERGER, and KOUBERGER (WENCESLAS and VINCENT), born probably at Antwerp about 1560; was there a pupil of Martin de Vos; studied at Rome and at Naples as a painter, and became *chevalier, seigneur de S. Antoine, conseiller, et surintendant-général des Monts-de-Piété*, as well as painter and architect to the governor of the Netherlands, the archduke Charles. His chief works were, at Tervuren the fountains and embellishments of that prince's château; at Brussels a church for the Carmelites 1607-11, destroyed 1785; another for the Augustinians 1620-42, restored 1782 and 1828, and lately used as a hall for public meetings; the gloomy Mont-de-Piété 1618, still in existence; and perhaps the design for the façade of the church of S. Jean Baptiste de la Beguinage, executed 1657-76; at Antwerp a church for the Augustins 1607 or 1615-18; and at Montaigu, about fifteen miles from Louvain, the church of Notre Dame 1609-17, which is said to have cost 300,000 crowns; the chapels shewn on the engraved plan were not executed. He died 1630 according to an epitaph formerly in the chapel of N. D. de la Portiuncule attached to the church of the Récollets at Brussels,

given in PAQUOT, *Mémoires*, fol., Louvain, 1765, i, 633. HENNE and WAUTERS, *Hist. de la Ville*, 8vo., Brussels, 1845, iii, 387, 533; COMMISSION ROYALE D'HISTOIRE DE BRUXELLES, *Compte rendu des Bulletins*, 8vo., 1848, xiv, 61, 571; REVUE DE BRUXELLES, October 1837. His portrait was engraved by Lucas Vosterman from a picture by Vandyck.

COELN. The German name for COLOGNE.

COELUM. The term used by FLORUS, *Epitome*, 3, v, 30, for a canopy (Gr. *οὐρανός*; Fr. *dais*, *poêle*); by VITRUVIUS, vii, 3, for the under side of a plastered ceiling, and in a somewhat similar manner by late Latin writers for each surface of a roof, as by GERVASIUS, *De Combustione*, etc., and by STUBBS, *Actus Pontif. Eborac.*, in *Hist. Angl. Scrip. decem*, fol., London, 1652, pp. 1290, 1704.

COEMAN, see MOL (HENRI DE).

COEMETERIUM (Gr. *κοιμητήριον*), a sleeping chamber, see CEMETERY.

CENACULUM, CENACULUM, and CENACULUM, and COENATIO. Both these words signify an eating room, in which the Romans took the latest meal, *cæna*, of the day: as such a room was during the later half of the Republican period usually in an upper story, the term *cenaculum* was applied to any room or suite of rooms above the ground floor, to which there was generally an external staircase, LIVY, xxxix, 14; CICERO, *Agrar.* ii, 35: and in the plural to all rooms in such an upper story, FESTUS, s. v. *Cenacula*; VITRUVIUS, ii, 8; so that finally it meant attics or garrets occupied by the poor in large houses, as customary in Paris and elsewhere, PLAUTUS, *Amphit.*, iii, 1; HORACE, *Epist.*, 1, i, 91; JUVENAL, *Sat.*, x, 17; APULIUS, *Met.*, 9. In opposition to these authorities may be placed the inscriptions, upon tombs, that mention the 'cenaculum sepulcro adjunctum', CAPACCI, *Hist.*, 4to., Naples, 1771, i, 9, which means a place near the tomb for funeral banquets. SUTONIUS, *Vitellii*, 7, uses the words 'cenaculum meritorium' for a hired lodging; and Augusti, 45, seems to mean by *cenacula*, boxes or family seats let for public profit in the upper stories of a circus. In the imperial times COENATIO or COENATIO became the title of the eating apartment suited to the reception of a *sigma* for seven, or a *stibadium* for eight persons; whether it was detached from the main building as a banqueting or summer house on the ground floor, or situated on the upper story, PLINY, *Ep.*, ii, 17, v, 6, in opposition to the *trichlinium* for nine persons on the ground floor. DIETA. 49.

The Greek words *ἀντίστοιχον* or *ἀντίστοιχον*, S. MARK, xiv, 15; S. LUKE, xxii, 12; *τρίστοιχον*, ACTS, xx, 9; and *ὑπερώον*, ACTS, i, 13, ix, 37, 39, xx, 8, are rendered by *cenaculum* in the Latin versions, and evidently simply mean "an upper room". S. S.

COFFEE TREE or WOOD, see GYMNOCLADUS.

COFFER. A panel of any regular geometrical form deeply recessed from the plane of a soffit, whether level or curved: the term *caisson* is sometimes applied to such a decoration in a ceiling, but coffer is the legitimate word. PANEL.

COFFER DAM (Fr. *batardeau*; Ger. *fangedamm*). A water-tight case made for the purpose of excluding water while such work as the wall of a wharf or the pier of a bridge is being carried up "in the dry", as the workmen say. It is composed of one or more rows of piles, usually two, between which clay or some impermeable material is driven. The conditions it is required to perform are that it should effectually exclude water, by resisting the external pressure, and the infiltrations either through its own mass, or at the line of junction with the natural bed. The piles generally driven close together, are sometimes grooved and tongued, or dovetailed, or if the water be not deep, the piles are driven 5 or 6 ft. apart, and grooved, with boards or plates let in the grooves. The exclusion of water is of very great importance, as affecting not only the cost of pumping, but even the effective value of the dam to such an extent as to reduce its moment of resistance by at least two-thirds. The general practical formula for calculating the thickness of a dam is given by NEVILLE in the CIVIL

ENGINEER *Journal* for 1840, iii, 78, as follows, when there are no stays:—

$$d = \sqrt[3]{\frac{125 c^3}{3 b s}}, \text{ in which } d = \text{the thickness of dam in clear}$$

of piles,  $c$  = depth of water in feet,  $b$  = height of dam in feet,  $s$  = mean weight of cubic foot of dam, usually = 90 lbs. WARR, *Dynamics*, 8vo., London, 1851; MOSELEY, *Mech. Prin. of Engineering*, etc., 8vo., London, 1843; ALBERTI, *De re Edif.*, ii, 6; and CRESSY, *Encyc.* In the CIVIL ENGINEER *Journal*, 1848, p. 231, is described a cheap and portable coffer dam invented by Stevenson.

G. R. B.

COFFERMAKER (THIERRI DE) designed for the church of S. Jacques at Antwerp the great tower commenced 1491, intended to exceed in height that of the cathedral; it remains incomplete.

COGGING, see CAULKING, COCKING, and COAK.

COG-HOLD. Whether girders or trimmer-joists be employed for placing the weight of floors upon a building in the safest manner, the bearing timbers ought to be placed upon pieces of stone as templates built into the walls, and be made to take a cog-hold of the templates, so as to enable them to tie and stay the walls by means of the cogs. A cog-hold is best obtained through the agency of a chair of cast iron, which should, however, be itself coggled or joggled to a stone template laid in the wall under it, and be capped or covered by another broad flat stone, as an inverted template, with a joggle from the chair running up into it; HOSKING, in the *Encyclopædia Britannica*, eighth edition (1855), supplement, s. v. Construction.

The width of the recess should exceed the breadth of the beam, leaving it clear on either side; and some clear space should also be left at the back, in order to permit free evaporation from the end of the beam, and prevent its speedy decay. With iron beams, these spaces are not wanted. J. W.

COGWOOD, see LAURUS.

COHESION. The force which unites the component molecules of a body, so as to form them apparently into a mass; it is presumed to be the reciprocal attraction of those molecules, acting at insensible distances, which is sufficient to resist the tendency of other forces to change this original condition of mass. The cohesion of the molecules of any body is the measure of its resistance to a crushing as well as to a drawing weight; for rupture evidently can only be effected when the constituent particles are displaced to such an extent as to destroy their original state. ADHESION. CRUSHING WEIGHT. STRENGTH OF MATERIALS. G. R. B.

COIGNE, COILLON, COIN, COYNING, QUINE, or QUOIN (Gr. *γωνία*; Lat. *cuneus*; late Lat. *cognus*; It. *conio*; Celtic, *cogn*; Fr. *coin*). This term, properly meaning a wedge, has been applied in English, like the Sp. *esquina*, Ger. *ecke*, and Fr. *chaîne d'encogiture*, or *chaîne de liaison*, to a corner of a building, and like the Sp. *cuña*, and Ger. *keil*, to a wedge; as well as to each of the stones forming the corner which are properly coin or corner stones. When used for a wedge it is specially applied to a block used to compensate the difference between a level and a sloping plane.

COILON (Gr. *κοῖλον*). The Greek word corresponding to the Latin *cavea*, used to express the portion occupied by the audience in a theatre.

COIMBRA. The chief city of the province of Beira in Portugal, and formerly the capital of the kingdom. The principal buildings are some of the thirteen churches: the embattled cross church formerly cathedral, called the *Sê Velha*, and said to date about 1129, has a clearstory to each of the aisles, and many other interesting details (its architects will be mentioned in the following article); on the south side is the Soares chapel (about 1543-63): the present large and elegant cathedral, formerly the church of the Jesuits, and dedicated to the Virgin Mary; the Romanesque churches of S. João de Almedina 1064; and S. Salvador, with a western doorway 1169, and a chapel 1495-1521; the present church of the Sta.



Cruz, of this last date, in the style *Flamboyant*, said to have been erected by French architects, having a choir with seventy-two stalls, and a fine chapter house and two-storied cloister 1521-57; with the second monastery of Sta. Clara, designed by J. Torriano, and commenced 3 July 1649. The old castle, still flanked with a few towers; the episcopal palace; the bridge, partly rebuilt 1513; the twenty-one arches of the aqueduct (1568); and the buildings of the university, with its observatory, etc., 1750-80, may also be named. A view of the city is given by MURPHY, *Present State of Portugal*, 4to., London, 1798, pl. 15.

COIMBRA (BERNARDUS and SVERIUS DE). The former is mentioned in the terms "in opera ecclesiæ magister per decem annos", the latter, as his successor, in a statement dated 1168, contained in a collection of documents called the 'Livro-preto' of the cathedral at Coimbra, which also records the four visits of another architect, Master Robert of Lisbon, "ut melioraret in opera et in portali ecclesiæ". RACZYNSKI, *The Arts in Portugal*, 8vo., Paris, 1846, p. 421.

COIN, see COIGNE.

COIRE or CHUR. A large and almost unknown mediæval city in the canton of Grisons in Switzerland. The upper part, inhabited by Roman Catholics, has walls with two gates and a moat, and contains the provosty, canonry, Capuchin monastery, the old convent of S. Lucius now containing a *seminaire*, the episcopal palace and the cathedral, dedicated to S. Lucius, this is said by STREET, *Brick, etc., Arch.*, 8vo., London, 1855, p. 35, to be "an architectural attraction far above the average amount of merit. Its plan consists of a nave of three bays, a choir of one bay raised by twelve steps above the nave, and a sanctuary much narrower than the nave and choir, also of one bay. The steps from the nave to the choir are narrow and on each side, and between them is a very flat wide arch", which in this author's illustration is shewn to have the keystone supported by a pillar resting upon an animal. The whole is of the very earliest Pointed work, and contains some remarkable tombs. Besides the town hall there are the absurdly painted Protestant church of S. Martin and its tower; the government house; the *schwarz-haus*, once the hôtel for foreign envoys; and a number of other still more ancient edifices in the lower town. 50.

COIRI (BERNARDINO DE) is mentioned under the date 19 May 1519 as one of the architects engaged upon the duomo at Milan. 27.

COKE (THOMAS) earl of Leicester, who died 1759, is generally said to have designed his seat at Holkham in Norfolk; his claims and those of Kent appear to be fairly stated by BRETTINGHAM, *Plans, etc., fol.*, London, 1773.

COKEL, or COAKEL, see COCKEL.

COKE OVEN. A sort of furnace for the manufacture of coal into coke. At present such an oven is generally not more than 10 or 12 ft. in length if circular, elliptic, square, or rectangular of 6 ft. in width. The walls, sometimes lined with fire-bricks, stand upon a flat floor bedded upon concrete, vary in height from 4 to 12 ft., and carry a vaulted roof which is sometimes pierced by a hole for the introduction of the coal. In front of each oven is a door about 3 ft. square. A damper to each oven generally governs a short flue that communicates with a long horizontal flue which leads to a chimney stalk, serving for a range of many ovens. STRICKLAND, *Reports*, fol., Philadelphia, 1826, p. 34, pl. 60-61, has described one form of oven; URE, *Dict.*, 8vo., London, 1835, s. v. Pitcoal, that on the London and Birmingham railway; and the AIDE-MÉMOIRE, 8vo., London, 1846, s. v. Railway, that on the Bristol and Exeter railway: the chief difference appears to be the thickness of the walls, which varies from 18 to 48 ins., according to the mode of admitting the air.

COLAGA or WOCULA. The name of a measure of land used in some parts of Hindostan, and supposed to be an area of six poles in length by five in breadth, each pole being 13½ sultan's gujas long, each guja being 37½ inches: but the colaga

varies in fact from 1-16 to 1-50 of an English acre. BUCHANAN, *Journey*, 4to., London, 1807, i, 372, 443.

COLAIB, see BEN COLAIB BEN THABITA (ABDALLAH).

COLASUMPOGHEY. A white wood of Canara, East Indies, 5 ft. in circumference and from 20 to 30 ft. in length, used for common buildings. 71.

COLCHIDIAN ARCHITECTURE. While Karthli or Georgia followed Armenian fashions, Lazicum and Abkhasia were subjected to the influence of Byzantine art until the end of the tenth century, as is evident from the church to the Virgin founded by Justinian about 550 at Pitzounda, the capital of Abkhasia; the church of S. Stephen at Khoni or Oni (Onogouris) in Imeretia, erected in the fourth century to commemorate a victory over the Huns; and one, perhaps restored by Justinian, in front of the palace of the Lazic sovereigns at their capital, Nakolakévi (Archæopolis) in Mingrelia. In the churches the Greek cross, adopted as a plan, had in the centre a dome supported by square pillars or by marble columns having capitals which imitate the Ionic and Corinthian orders; the church at Kertch, founded 757 according to an inscription on one of the columns of the dome, is almost the only existing intact specimen of this style; although those of Cherson, Aithodor, and Aioudagh, also in the Crimea, and those of Abkhasia, were chiefly built in the same style. The practice of building with brick and stone in alternate courses, or of building the interior with brick and the exterior with stone, prevailed in Colchis until the eleventh century, but is very rare in Persia or elsewhere east of the Caucasus. In this category may be included the churches of Abkhasia, at Nakolakevi, at Tchamokmodi in Gouria; and the palace at Tsikhédurbasi in Imeretia, etc., as well as the ancient walls of Archæopolis. DUBOIS DE MONTPEREUX, *Voyage autour de Caucase*, 8vo., Paris, 1839, i, 404.

COLD BLAST. The air forced through smelting furnaces at its natural temperature is said to constitute a *cold blast*, in contradistinction to the air blasts heated by artificial means. The irons obtained by the use of the cold blast are tougher and stronger than hot blast irons, and present a closer texture and a smaller crystallization than the latter. The Blaenavon, Coed Talon, Low Moor, and Muirkirk irons, are amongst the most esteemed varieties. It appears that the specific gravity of the cold blast irons is inferior to that of the hot blast irons, and that their modulus of elasticity is generally speaking less. *Seventh Report*, BRITISH ASSOCIATION; FAIRBAIRN, *Cast and Wrought Iron*, 8vo., London, 1854. BLAST. G. R. B.

COLD CHISEL. The steel chisel used by smiths to cut cold iron; it is also called a 'chipping chisel'. It is made rather stouter and with a more obtuse angle than the *hot* chisel, which is used for cutting hot iron. G. R. B.

COLD SHORE IRON. "A soft short iron of which nails are made, and infinite other commodities, in Worcestershire, Shropshire, Staffordshire, Warwickshire, and Derbyshire, from metal or iron stone quite different from that of the Forest of Dean", is the explanation given of this term by YARRANTON, *England's Improvement*, 4to., London, 1677. NEVE, *Dict.*, 1736, defines coldshire iron as that which is brittle when cold.

COLD SHORT IRON. Iron or steel which breaks easily with a short crystalline fracture when cold, is said by workmen to be "cold short". This is one of the greatest defects in metals liable to be exposed to blows, vibratory motions, or effects of torsion. WRIGHTSON, in a paper read at the British Association 1849, given in the *CIVIL ENGINEER Journal*, xii, 342, shewed by analysis the tendency of the hot blast to produce cold short iron by occasioning an increased reduction of phosphoric acid, and a consequent increase of phosphorus. The explanatory statement may be questioned. CINDER IRON. G. R. B.

COLD SHUT. The name given in iron foundries to a fault which occurs when castings are too long to be run from one head. The two streams frequently cool in passing over the damp sand of the moulds, and are not in a sufficient state of

fusion to unite properly together when they meet. Sometimes the fault arises from the streams carrying at their extremities loose portions of sand or coke dust, preventing in similar manner the entire mixture of the fused metal.

A. A.

COLE. A term obtained from the French *colle*, and used in early mediæval manuscripts for a kind of glue, probably size. CLEARCOLE.

COLE (CHARLES), crown surveyor, built about 1772 for himself the houses in Ely-place, London, ALLEN, *History, etc., of London*, 8vo., London, 1828, iv, 431.

COLE (JOHN) is said to have been the master-mason, i. e. architect, of the stone spire of Louth church in Lincolnshire, which was built 1500-1515, 140 ft. high from the gutter, and cost £305; 7:5: ARCHÆOLOGIA, x, 72, which shews that Christopher Scune succeeded him in 1506.

COLECHURCH (PETER OF), priest and chaplain. It was probably the register of the priory of the Holy Trinity at Bermondsey that gave to STOW, *Survey*, p. 58, the statement that a new London bridge was built 1163 of elm timber by this architect; and the annals of the Cistercian abbey at Waverley in Sussex, note that in 1176 the stone bridge at London is begun by Peter the chaplain of Colechurch; S. Mary Colechurch stood on the north side of the Poultry in London. DICETO (1200) calls him a native of London: LELAND and HOWEL both say that a mason, being master of the bridge house, built the chapel on London bridge from its footings at his own expense. In 1201 Isenbert of Xaintes was recommended to the citizens by the king for employment in building the bridge. The ANNALS OF WAVERLEY notice that 1205 died Peter the chaplain of Colechurch, who began the stone bridge at London, and he is sepulchred in the chapel upon the bridge: or according to MATTLAND, *History*, p. 46, under the chapel staircase in the middle of the building, where the remains of a body were found in 1737. THOMSON, *Chronicles*, 4to., London, 1827.

COLIGNY STONE. A *mollasse* or *grès vert*, quarried from the foot of a hill called Coligny near Geneva; la *hôtel-de-ville* in that city is built of it. BRARD, *Minéralogie*, 8vo., Paris, 1821, ii, 44.

COLIN (EL MAESTRO), director of the works at Aranjuez in Spain, probably designed the buildings added about 1536 in the park, and the repairs or additions to the *palacio maestral* of the order of Santiago at the same place. 66.

COLIN or COLLIN, in Bohemia, see KOLIN.

COLISEUM, properly COLLOSSEUM.

COLLALLO STONE. A very fine white sandstone, obtained at Collallo near Inverkeithing in Fifeshire. The upper bed, which is the finest and whitest, furnishes landings up to 8 ft. square; but it is occasionally discoloured by arms of trees found embedded. The lower bed is darker and harder, and furnishes blocks up to five tons weight. The stone is sawn with sand and water at 1s. per ft. superficial by hand. The labour is more than upon Portland, consequently the expense of repairing tools is also greater. The quarry not being remunerative, its working is now almost abandoned. It was used by W. Wilkins, R.A., in Nelson's memorial, Great Yarmouth; in King's college bridge, and in the staircases of Downing college, both at Cambridge.

R. R. R.

COLLAR or COLLARINO, frequently but improperly spelt COLARIN and COLARINO. This term has been explained in so ambiguous a manner that it is difficult to decide what it really means: GWILT, *Encyc.*, s. v., says "a ring or cincture; it is another name for the astragal of a column: it is sometimes called the neck, gorgerin, or hypotrachelium;" and MILIZIA, *Diz.*, s. v. Dorico, uses it in the latter sense, which seems correct.

COLLAR or COLLAR-BEAM, called 'choler' by early English writers on architecture. A piece of timber connecting opposite principal rafters, or the small rafters of a roof, and placed above the level of the feet of the rafters. In old roofs the collar is frequently framed into the rafters, sometimes halved

on to them, but at present it is merely spiked on to their sides. In old common purlin roofs, the purlins were often seated upon the collar; and there were sometimes two or more collar-beams to the same rafters; and the collar sometimes supported a sort of king-post. The name is sometimes given to the straining piece of a queen-post truss.

COLLE (ARNOLFO DI CAMBIO DA), also called ARNOLFO DI LAPO, see CAMBIO (ARNOLFO DI).

COLLE. A city in the province of Florence in Tuscany. It contains a cathedral dedicated to S. Marziale, four parish churches, and the chapels of three monastic establishments. 96.

COLLEGE. A term appropriated not only to any association that is corporate or supposed from prescription to be corporate, but also to the building occupied by such a body of persons. The association may be clerical, or lay; for charitable, educational, or any other purpose; and legally or popularly called by a different name. The word having been adopted in England for any foundation such as those at Cambridge and Oxford, endowed with revenues for the encouragement of students, or for an incorporated body, such as those belonging to the university of London, consisting of governors and professors; is being preferred to any other name for almost every new educational establishment that seeks notoriety. Buildings called colleges are adapted for the special purposes of the associations, and have different arrangements in almost every instance. Those of the universities, however, generally consist of one or more courts or quadrangles, in some instances with cloisters; numerous apartments for the fellows, tutors, and students; houses for the principal (often detached) and for the professors; chapel; library; dining hall; lecture rooms; combination room; common room; buttery; kitchen with other offices; gate house; porter's lodge, etc. Some also have fine gardens and walks; the whole building varying in extent and accommodation according to the number of fellows and students, and the liberality of the founders and benefactors. In France, to obviate certain inconveniences, the students in the university of Paris were gathered soon after the twelfth century into colleges, i. e., privileged associations, living in buildings appropriated to their use as chambers and schools: at present a *collège* being either one of the forty *collèges impériaux* or *lycées*, formerly called *athénées*, supported by the state, or one of the three hundred and twenty *collèges* often properly called *écoles communales* or *secondaires* supported by the communes, does not exact residence within its walls any more than the colleges of London; but the *séminaire* which is a theological school supported by the clergy must be closed unless residence is exacted, and this real college is ranked as equal with the *lycée* or *collège*. GYMNASIUM; SCHOOL; UNIVERSITY.

The term college in the *ecclesiastical* sense is applied to the buildings originally erected by the secular clergy; those erected by the regular orders being strictly speaking convents. The order of regular clergy of S. Paul called Barnabite monks founded 1533, however, terms its monasteries colleges, and so does the society of Jesuits founded 1536. Several persons residing together and dividing an endowment, as the vicars attached to the cathedrals at Salisbury and Wells, and as the several priests sometimes attached to one chantry chapel, were often called a college. The real rank of any building called a college chapel, or a collegia or collegiate church, must depend upon the application of the definitions given, s. v., CHAPEL and CHURCH; because such titles have been, and are, indiscriminately applied to the oratory of a body of clerks under some president other than a bishop. Such a college was generally bound to maintain a school, or an almshouse or both. When a college was founded in a parish or other church the building would have no peculiarities referable to its new purpose; when the oratory was built for the college, it was evidently merely a FREE CHAPEL, sometimes even a DOMESTIC CHAPEL, and as at Eton the nave became merely an ANTE-CHAPEL; but where a large nave forms an original portion of the building, it must have been intended for the accommoda-



tion of the inhabitants of a district as at Crediton and at Southwell, which is improperly called a minster. Excepting in the universities and at Winchester, and perhaps the Temple in London, few colleges remained in England after 1560; their chapels or churches were legally styled 'royal free chapels collegiate' as at Manchester (now cathedral), Wimbourne called a minster, S. Burien's, Wolverhampton united with Windsor, Eton, and perhaps the archpresbytery of Haccombe; and 'collegiated churches' as S. Peter at Westminster (formerly a Benedictine abbey church), Southwell, and Ripon also called a minster and now cathedral. At Tonge in Shropshire, part of the buildings of the college remain, or lately remained, on the north side of the churchyard, the almshouses forming a detached structure. Chelsea, Dulwich, Sion, etc., colleges, are of late date.

COLLINS (JEAN), with Liévin Boonen renewed 1429 almost entirely the choir of S. Nicholas at Ghent. *REVUE DE BRUXELLES*, Oct. 1857, p. 7.

COLLIQUIÆ. A term which is used by VITRUVIUS, vi, 3, as part of the means of taking the water off a Tuscan impluvium. They are described by FESTUS, s. v. *imicium*, who writes *collicie*, as tiles through which water may "flow into a vessel". As VITRUVIUS describes them coming from the angles of the walls, they were probably *valley tiles*: and as COLUMELLA, ii, 8, and PLINY, *H. N.*, 18, 49, evidently use the word in the sense of the large diagonal furrows in fields connecting the ordinary furrows with the ditches, and which we call "catch furrows", the idea seems strengthened.

COLLUVIARIUM. An old reading of a passage in VITRUVIUS, viii, 7. The author is directing the method of conveying water across a valley by means of a conduit, with a venter or level portion at the bottom; and in this he says 'let there be made (.....) by means of which the force of the spirit may be weakened.' Some old copies of VITRUVIUS have 'colluviaria', which BEROALDUS, commenting on SUTTONIUS, *Augusti*, supposes to have been holes to take out 'colluvies' or mud: others prefer 'columbaria', i. e. emissaries or outlets. The probability is that the blank should be filled up by 'stand-pipes for the escape of air and gases, and to compensate for expansion', so that 'columnaria' would be the correct reading. A. A.

COLMAR or KOLMAR. A city formerly episcopal, in the department of the Haut Rhin in France. The cathedral, commenced as a collegiate church about 1237, was slowly continued; Guillaume de Marbourg who died 1363, is said to have designed the edifice, i. e., the choir, about 1350: his successors were—Heinrich Arnolt, *rathswerkmeister* 1378; Vincenz 1460; Lux 1499; and Lorenz of Ueberlingen, who built the central tower 1505. The stained glass in the choir was originally in the church of the Dominican monastery. The lady chapel seems to have been executed some time after the choir. The chief other edifices are the church of S. Pierre rebuilt 1536 and 1750; the commandery of S. Jean; the Augustin monastery, now a prison, the church being destroyed; and the much admired church used as a corn exchange, formerly part of the Dominican monastery, now a barrack; the church of the Holy Trinity, belonging to the Récollets, has been divided since 1676, the nave for the Protestants and the choir for a civic hospital. A barrack and a military hospital occupy the two Dominican nunneries. The *palais de justice* and *hôtel-de-ville* are worth notice. GOLBÉRY, *Antiquités*, fol. Paris, 1828, pl. 15, 16.

COLOCZA in Hungary, see KALOCSA.

COLOGNE or COELN (the ancient Colonia Agrippina). A city in Rhenish Prussia. It has a few remains of Roman walling, several portions of Frankish walls and towers (especially the Klarenthurm of brick in *opus reticulatum*), and outer walls with towers and gatehouses built between the twelfth and fifteenth centuries, but chiefly about 1185. Until 1790 the city contained ten collegiate churches besides the cathedral, two abbeys (S. Pantaleon and S. Martin the Greater), twenty parish churches, fourteen monasteries, thirty-seven convents, nine hospitals, and seventeen public buildings: since 1815 the cathe-

dral and three other parish churches, with sixteen *succursales* and eighteen other buildings, alone have been devoted to religious purposes, while the number of public offices, etc., has increased to thirty-two, and the rest of the establishments above named have been chiefly secularized. The cathedral, the finest in Germany, and scarcely equalled by any in Europe, is dedicated to the Holy Rood and S. Peter: although commenced in the ninth century as a double apsed church, it appears to have been rebuilt or restored about 1248, or according to some of its historians 1270-75; but the arguments on this question will be found in DIDRON, *Annales Archéologiques*, 4to., Paris, vii, et seq. The following list published by FAHNE, *Diplomatische Beiträge*, etc., Cologne, 1842, gives the names of the first architects of the cathedral, viz. Heinrich Sunere or Seynere, 1248-1254; Gerard von Rile, also called von Kettwig and de Sancto Trudone, 1254-95; Arnold, 1295-1301; his son Johann, who built the choir, 1301-30, it was consecrated 1322; Ruetger, 1330-32; — Michael, 1368; Andreas von Everdinge or Everdlinge before 1412; Nicholas von Buere, 1433-52; Konrad Koene or Kuyn, 1452-68; the works were stopped 1500-09, leaving the choir complete, the southern tower raised two stories, and the foundations of the other with the nave piers and walls, a few feet above the ground. From 1824 to 1842 under Ahlert (who died 10 May 1833) and Zwirner, about £35,000 had been spent in repairs; the works were resumed by laying the first stone of the transept on the 4 Sept. 1842; and about £150,000 has since been expended. The interior length of the church is 462 ft., and the breadth of the five aisles 145 ft.: the towers were to have attained a height of 480 ft. according to the original designs, which still exist, as well as successive account-books; some of them have been published by MÖLLER, *Fas-simile der original Zeichnung*, fol., Darmstadt, 1818 and 1837, but the most finished is not above 185 ft. in height: the choir is 141 ft. high inside, and the three-aisled transepts are 242 ft. long. Independently of the dimensions, the edifice is remarkable for its proportion and the beauty of its general composition. The foundations of the southern tower are known to reach at least 44 ft. below the surface of the ground. The stone originally employed was obtained from quarries at Koenigswinter and Unkel-Bruch; but that now used is from Niedermendig and Stenzelberg. The fine glass and the stalls and seats of the choir, dating early in the fourteenth century, and five windows in the nave 1508, with several tombs, especially those of Philip von Heinsberg (1191) and Conrad von Hochsteden (1261), deserve attention. The building has been frequently described; among the most important publications are those by BOISSERÉE, *Histoire*, 4to., Munich, 1823, with the large plates of his *Geschichte*, fol., Stuttgart, 1823; MÖLLER, *Bemerkungen über die Aufgefundenen*, etc., text, 4to., pl. lar. fol., 1818 and 1837; GUHL, *Der Dom*, 4to., Stuttgart, 1851; GAILHABAUD, *Mons. Anc.*, etc., 4to., Paris, 1844. Many of the annual reports made by the architect are given in the *ECCLÉSIOLOGIST Journal*, which in the present year (1857), pp. 97, 287, shows that the south tower materially differs from the old designs, that the walls of the nave and transepts are completed, and that the consecration of the entire edifice is expected to take place in 1863.

Some of the churches exhibit very fine specimens of the Rhenish Byzantine style, as will appear from the following dates. Among the chief buildings are S. Cunibert, 1200-1248, the larger of its towers was burnt 1376, rebuilt 1388, it fell 1830 and destroyed the vaulting, which has since been repaired; the stained glass is the least recent in Cologne: S. George 1060-74, with later vaulting and a baptistery 1200, the choir is higher than the nave: S. Gereon with the choir, apse, and tower 1066-69, and a decagonal nave 1201, rebuilt 1227: S. Martin 1172, the tower burnt 1378, rebuilt by Ewald von Bacharach 1500-50; the modernised interior 1790 (RAMÉE, ii, 390): S. Pantaleon chiefly 1622, but with the lower portion perhaps 980-1000: S. Maria auf dem Kapitolium founded 700,

the greater part dating 900-1100, the nave altered and three east end apses put in the twelfth or thirteenth century, the pointed vaulting 1350-1400, tower 1637: the Aposteln 1020-35, burnt 1098 and 1199, when the upper part of the nave and the western transept (for there are double transepts) was rebuilt: and the church of the Jesuits 1636: the choir of the Dominican church, said to have been built by Albertus Magnus about 1250, and in which he was buried, has been lately injured by restorations; *BUILDER Journal*, xi, 455. The *arresthaus* or prison lately built on the radiating system; the *rathhaus* or townhall belonging to the thirteenth century with a Pointed tower 1414, and marble Italian portal on double arcade 1571, *MOYEN AGE MON.*, pl. 27; the *kaufhaus* or *Gürzenich* finished 1474, now a storehouse; the *tempelhaus*, in a Byzantine style, now used for public meetings and as the exchange; the *casino*; the *regierung's gebäude*; the archiepiscopal palace; and some old dwelling houses, most of which have slated roofs, are the chief other buildings of importance.

In the environs is the Cistercian abbey church of Altenberg; the choir 84 ft. high, begun 1255, was finished 1265, and the rest 1379; there is some fine glass; the pulpit, altar, and tombs deserve study; the buildings (1214), were ruined by fire 1815, and have been restored. It is illustrated by SCHIMMEL, *Die Abtei-kirche*, fol., 1832. Most of the edifices above named are illustrated in BOISSERÉE, *Monuments, etc., du Rhin Inferieur*, fol., Munich, 1842; and much of the furniture, glass, etc., in GAILHABAUD, *L'Arch. du Moyen Age*, etc. 14. 28.

COLOGNE ( . . . . OF). There were several architects who are thus styled in order to distinguish them from others having the same Christian name. The laybrother or novice, ALBERO or VOLBERO, who finished 1219 the vaulting (*wölbung*) of the Apostelnkirche at Cologne, was probably the same as the *magister* who began 1209 the stiftskirche at Reuss. CONRAD was the *baumeister* 1316, of the Carmelite monastery at Cologne. RUETGER 1330-32, and MICHAEL 1368 mentioned in the preceding article. JOHANN erected 1369, the two large churches at Campen or Kampen on the Yssel or Zuyder zee, and in the Marienkirche he made use of the plan of Cologne cathedral. Another JOHANN followed bishop Alonso de Cartagena to Spain, and began 1442 the towers of his cathedral at Burgos, probably its capilla de la Visitacion before 1456, the church of the Carthusian abbey at Miraflores commenced in 1454; for its design he received 3350 maravedis (£1: 19: 0 of those days); it was continued after his death 1466, by Garcia Fernandez de Matienzo, and was finished 1488 by Simon the son of Johann. This SIMON probably designed the capilla del condestable in the cathedral at Burgos, the clearstory windows to the cathedral and its capilla de la concepcion, besides many other German-Gothic edifices in the same city; he died in 1512; among his pupils are reckoned Francisco de Colonia, presumed to have been his son, Alonso Covarrubias, and Diego de Siloe: the important works executed immediately after 1420 to the cathedral at Barcelona are attributed to Johann and Simon, by OTTE, *Handbuch*, 8vo., Leipzig, 1854, p. 180. A third JOHANN the *domverkemeister*, and ADAM the *steinmetzer*, were consulted by the architect Gerhard von Lobmar 1483-7 on the building of the middle aisle of the Victorskirche at Xanten. 92.

COLOGNE EARTH. A native pigment obtained from the Mendip Hills in Somersetshire and near Birmingham in England, as well as at several places on the continent, but chiefly at Putzberg near Friesdorf, about four miles from Bonn. It is a good brown, of powerful body, and durable both in water and in oil; but it varies in hue, and in the rather tardy rate of drying when mixed with oil. 9. 28.

COLOMBAN (ANDRÉ) of Dijon, probably completed in 1536 the cathedral church of Brou, the whole of the work is sometimes attributed to him; DIDRON and DUPASQUIER, *Hist., etc., de Brou*, fol., Lyons, 1842, pp. 43-67. He is not to be confounded with Michel COLOMBAN of Tours, who is perhaps the Michel Columb who executed the tomb of Francis, the last

ARCH. PUB. SOC.

duke of Bretagne, in the cathedral of Nantes, 1507; SOMMERARD, *Hist., etc., de l'Hôtel de Clugny*, 8vo., Paris, 1843, p. 183.

COLOMBELLE STONE. A stone still procured from the shelly calcareous beds peculiar to the neighbourhood of Caen, in a quarry at a village so called on the road to Savenelle; it is said locally that this quarry was worked by the English; that it was exported to England at the time of the Conquest; that S. Paul's, London, is or was built of it; and that it is still exported to the Low Countries: BRARD, *Mineralogie*, 8vo., Paris, 1821, ii, 18.

COLOMBO or CALOMBO. The capital of the British government in Ceylon. The fort and town contain straight streets at right angles, filled with houses chiefly one story high having wooden verandahs and brick floors: the dwellings of the Dutch inhabitants are distinguished from those of the English by having glazed windows instead of *ventiliones* or *jalousies*. The principal buildings are the governor's residence; the government offices and courts of law; the gaol; a lighthouse (1830-35); the exchange or hall of commerce (1850-55); the cathedral dedicated to the Holy Trinity, 1846, having the fittings of ebony (it was designed and carried out by a corporal in the 15th regiment; CHRISTIAN KNOWLEDGE SOCIETY, *Report*, 1855); the Dutch church, 1746, which is a large cross church in the centre of the town; seven other churches and chapels; two handsome mosques with minarets; and several mean Hindoo temples. 14. 50.

COLONA (JUAN DE) was appointed 2 March 1534 *aparejador-mayor* to the cathedral at Seville as successor to Melchior de Bonilla, and under Martin de Gainza he erected the *capilla-real* to that building. 66.

COLONA (FRANCISCO DE), *maestro-mayor* of the fortifications of the Havannah in the island of Cuba, finished 1582 the erection from his own designs of the custom house in that city. 66.

COLONIA (ANTONIUS DA) occurs under date 14 September 1399 in the list of architects to the duomo at Milan. 27.

COLONIA (JUAN DE) and (SIMON DE), see COLOGNE ( . . . . OF): FRANCISCO DE, probably the grandson and son of the preceding, was born at Burgos in Spain, and employed to report on the works executed under Juan Gil de Hontanón for the cathedral at Salamanca 1515 with maestro Martin of Palencia, and 1522 with Juan de Badajoz. 66.

COLONNADE. A range of columns. When surrounding a building on the exterior as in a peripteral temple, or the interior of a court as in houses at Pompeii, it is called peristylum. When detached from the general line of the front and projecting forwards it is called a portico, as in the Pantheon at Rome. When not projecting, as that of the Louvre, it is called colonnade; and in the front of the British Museum there is the central portico and the peristyle or colonnade also, continued along the walls. There were lines of colonnades or porticos running right through many of the Asiatic cities built during the times of the Antonines, as the famous one of Palmyra, and several, noticed in BEAUFORT, *Karamania*, in the cities along the coast of Asia Minor. The classic porticos were probably colonnades near the fora, and public gardens, and occasionally a double row of columns covered by a roof and enclosing the courts of temples. T. L. D.

The number of columns in a colonnade is briefly expressed by the terms distyle, tetrastyle, hexastyle, octastyle, decastyle, etc. Other conditions of these columns may be expressed by the terms in *antis* and *prostyle*, which last is rarely used; and by the recognized terms for the intervals of INTERCOLUMNIATION. 2. 4. 23.

COLONNETTE. A French term adopted in the English language for a column of small dimensions: the pseudo-Doric column under the roof in the tower of Andronicus Cyrrhestes at Athens are perhaps unique in ancient classic art. These may be paralleled with the small columns in the triforia and windows of the earlier mediæval churches; BUCKLER, *History*,



etc., of *S. Alban's*, 8vo., London, 1847, p. 134, gives some good examples. At present the word is generally restricted to any imitation of the Greek and Italian orders employed as a BALUSTER. BALUSTER COLUMN.

COLOSSEUM (sometimes written COLISEUM and COLISEUM; late Latin *colisæus*; It. *coliseo* and *coliseo*). The modern name given to the Flavian AMPHITHEATRE at Rome, either from its having a frontage to the area which contained the colossal statue of Nero, or from (the It.) *colosseo*, corruptly written in consequence of its colossal extent. This edifice was commenced A.D. 72 and first used in 80. A tradition of the Roman Catholic Church assigns to Gaudentius, a Christian, the honour of being the architect. The building, constructed principally of travertine stone, concrete, and brickwork, is supposed to occupy six acres of ground, and at least to have accommodated 80,000 seated spectators, with standing room for 20,000 more. The form is the usual ellipse, with an arena 287 ft. long and 180 ft. wide, and the entire length is, on the major axis 620 ft., on the minor 513 ft., the extreme height is 157 ft.: about two-thirds of this height have disappeared in parts. The original structure, finished by Domitian and repaired by Severus, Macrinus, and Theodosius, was first despoiled by the citizens under permission from Theodoric in 519, but was tolerably perfect in the eighth century. The west and south sides are supposed to have perished during the siege of Rome, 1085, by Robert Guiscard. It was used until 1311 as a fortress by the Frangipani and Annibaldi families, and a bull-fight was exhibited in it 3 September 1332. After the partial destruction caused by an earthquake, 1349, the building supplied materials for the palazzi di Venezia (S. Marco), Farnese, etc., until 1750. It is fully illustrated in FONTANA, *L'anfiteatro*, fol., Hague, 1725; and the numerous subterranean works discovered 1812 are given in RE and BIANCHI, *Osservazione sull'Arena*, fol., Rome, 1812. TAYLOR and CRESY, *Arch. Antiq.*, fol., London, 1821, give the above dimensions; GAILHABAUD, *Mons.*, i; CANINA, *Gli Edifici*, fol., Rome, 1851. BESTIARIUM.

COLOUR. The effect produced on light according to the various conditions in which the rays are acted upon by the object upon which they impinge; that is to say, whether they are absorbed, diffracted, diffused, reflected, transmitted, etc. In speaking of colour *per se*, or simply in its relation to light, only three primary colours are acknowledged, red, yellow, and blue; and three secondary colours formed by combinations of some two of the primary, viz., orange, by red with yellow; green, by yellow with blue; and violet by blue with red: in addition to these two classes, three tertiary or composite colours are formed by combinations of all the three primary colours with one predominant, viz. russet, citrine, and violet. A neutral colour is a combination of the primary colours in equal proportions. To keep in mind these simple principles is of essential importance in the consideration of the subject of POLYCHROMATIC DECORATION. White and black are not included in the category of colours. The theory of colour, as connected with light, is frequently confounded with the practice and theory of material colours, which will be considered under the articles PAINT, PIGMENTS, and STAIN. ACTINISM: CHROMATOBLEPSY: HARMONY: LIGHT. BREWSTER, *Optics*, 8vo., Philadelphia, 1844, pp. 69, 235, 316. H. B. G.

COLTIE TIMBER. Timber is so called when the heart is loose and slips out. SOUTHEY, *Common-Place Book*, series 4, 8vo., London, 1851, p. 494. W. R. G.

COLUMBANI (PIETRO PAOLO), born at Milan and resident at Raudnitz in Bohemia, built the gorgeous collegiate church, etc., in the neighbouring town of Chotieschau, where he was buried 1749 in the Marienkirche. 20. 26. 68.

COLUMBARIUM. The Latin term for a pigeon hole as well as for a pigeon house containing a number of such holes; DOVE-COTE. In consequence of a supposed resemblance, the word was also applied to each hole formed in a wall for the reception of the end of a beam or joist, VITRUVIUS iv, 2 (It.

*buca*; Fr. *trou de boulon*; Ger. *loch*); and to each hole or niche, formed in the walls of a tomb, to receive a cinerary jar (*olla*), or a coffin. The term has been given by modern writers to the particular form of sepulchre assumed by such tombs. This use of the word was adopted on the authority of a single inscription, by GORIO, *Monumentum*, fol., Florence, 1727, describing such a structure discovered 1726 on the via Appia, but recently (1856) destroyed, and supposed by him to have been appropriated to the freedmen and slaves of Livia Augusta and the Cæsars. The adoption was impugned by LUPI in MARINI, *Atti etc., de' Frati Arvali*, 4to., Rome, 1795. Columbarium means a tomb, excavated, built, or of mixed construction, having its walls worked into niches for the reception of *ollæ* or cinerary urns made of baked clay. These contained the ashes of a family, the freedmen, and the slaves, governed by a *pater familias*, in which case the tomb was a *sepulcrum familiare*; if also of similar families governed by his heirs it was a *sepulcrum hereditare*; DIGEST, xi, 7, v: and was thus distinguished from a similarly arranged *sepulcrum commune*, which received the remains of individuals belonging to different families; CICERO, *Off.*, i, 17; AUSONIUS, *Epitaph.*, xxxvii, 1.

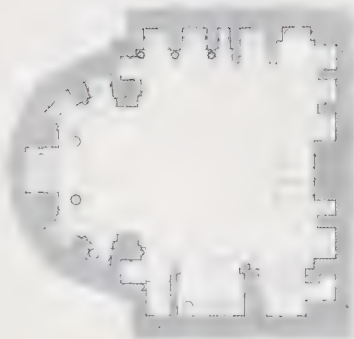
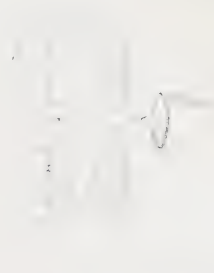
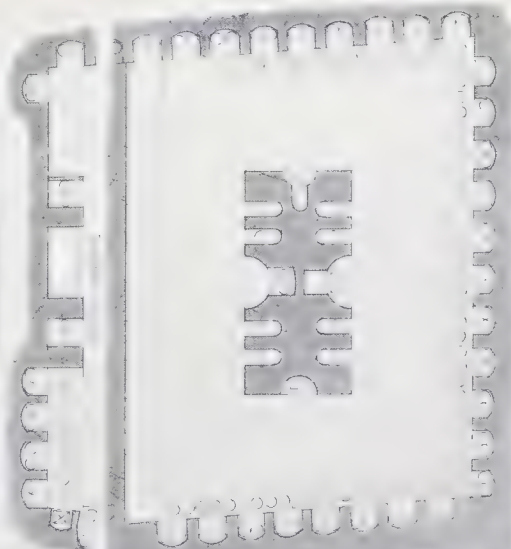
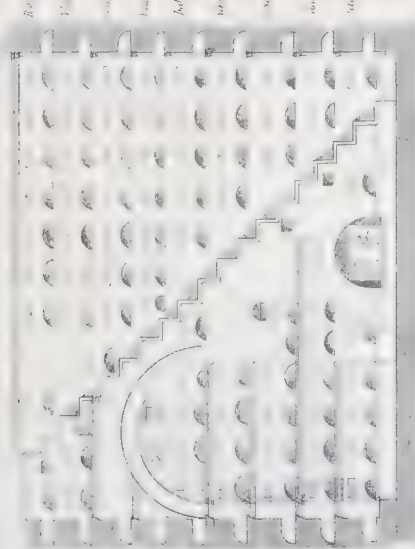
This form of sepulchre is found at Naples and in Sicily, but examples of it at, or near, Rome are better known; such are those of the freedmen of Augustus, and of the Volusian and Cæcilian families near the temple to Rediculus, those in the vigna Codini within the porta S. Sebastiano (*Illustrations*), (all on the via Appia); one within the porta Latina (*Illustrations*); of both these illustrations a full account with plates is given in CAMPANA, *Due Sepolcri Romani*, fol., Rome, 1841; two just inside the porta Maggiore; one discovered 1822 at the villa Rufini, about two miles beyond the porta Pia; and others situated near the villa Doria Pamfili; besides those sketched in FABRETTI, *Inscr. Antiq.*, fol., Rome, 1699, who also gives the average dimensions of the variously shaped niches, etc.; the following notes are from his work. The term *columbarium* applied to each niche was sometimes superseded by *edicula* and *edificium*, but more usually by *ollarium*. The niches in a *sepulcrum commune* sometimes amounted to several hundreds in number, and the owner of the tomb could give or sell such as he chose, with or without the rights of *actus*, *aditus*, *ambitus*, and *itus*, as approaches were called. The urns singly, or even in groups of four, but generally in pairs, were let into the floor of the niche, the lids only being seen, while the inscriptions were placed in front. If the cinerary or other bronze, glass, or earthen urn was placed on the floor of the niche, it appears to have been frequently enclosed in a case of marble or stone, one of which has been found inscribed with the word *ossuarium*: and the little sarcophagi as they are called commonly in museums served a similar purpose. Sometimes the niche was of a shape and size sufficient to receive a coffin of baked clay or other materials on its floor: but generally the pavement of the tomb was divided out for this purpose, or its floor was excavated for the reception of the *vasa obruentaria* or coffin for the unburnt corpse. The urns that had not been occupied were called virgin *ollæ*. It is rather doubtful whether there was any difference between the collective columbarium and MACERIA: but the confusion of *cinerarium* with the former word in any sense is a mistake. CATAcomb. OPE. LYSONS, *Mag. Brit.* (Cambridge-shire), mentions a columbarium of the Hatton family at All Saints church in Long Stanton. 14. 28. 78.

COLUMBEION (Gr. *κολυμβεῖον*) was a Greek name for a fountain placed in the atrium before a church; and COLUMBETHRA (Gr. *κολυμβήθρα*), the Greek name for the piscina or pool in a baptistery. BINGHAM, *Origines*, 8vo., London, 1840, ii, 396, 466.

COLUMBIA. The capital of the state of South Carolina in the United States of North America. The streets 100 ft. wide are placed at right angles, and contain a state house, a court house, market house, prison, six churches, two banks, and the extensive buildings of the South Carolina college.

COLUMBARIUM

Fig. 1.







**COLUMBINE COLOUR.** The popular term for a light purple colour made with carmine and a little ultramarine; while **COLUMBINE RED** is the name given to a mixture of red with a little blue and much black; for which the garnet is proposed as a standard by **ANSTED**, *Elementary Treatise*, 8vo., London, 1850.

**COLUMBUS.** The capital of Ohio in the United States of North America. In 1812 it was a forest, but now contains about 20,000 inhabitants. The wide streets are laid out at right angles around a square of ten acres: at the south-west corner of this square is the capitol or state house, erected 1852 by W. Russell West, given in the *BUILDER Journal*, 1852, x, 658; the fronts 304 ft. long, and the sides 184 ft. long, are of a Greek Doric order; a large central circular hall gives access to the supreme court, the library, and the chambers of the representatives and the senate. Besides the spacious and handsome state penitentiary, the city contains the old state house, a brick building 75 ft. long and 50 ft. deep, with a steeple 106 ft. high; numerous churches; three asylums for the deaf and dumb, built of brick with Doric porticos, for the lunatic, and for the blind; and as many large educational establishments.

**COLUMEN.** A word used by **VITRUVIUS**, iv, 2, and which has been supposed by most commentators to signify the wooden ridge of a roof. There is some confusion in the above passage between this word and **COLUMNA**. **MATERIATIO.**

**COLUMN** (It. *colonna*; Sp. *columna*; Fr. *colonne*; Ger. *säule*). The distinguishing name given to any pillar employed in one of the recognized orders of Classic, Renaissance, or Neo-classic architecture, or having at least so much resemblance to such a pillar as to justify the assumption of the name. The essential parts of a column are a shaft, a capital, and, except in the Greek Doric order, a base. The column is generally of greater diameter at the lower part than next the capital; sometimes its section is purely conical; at others diminishing with an entasis or swell; at others with an equal diameter for the lower third in height, and thence gradually lessening up to the capital. It should be observed that **PLINY**, *Hist. Nat.*, xxxvi, 56, says "columnæ quaternis angulis", as if he did not deem that a column must necessarily be round on plan. **BASE**; **CAPITAL**; **PILLAR**; **SHAFT**, etc.

**THIERSCH** discovered at Tyrius a range of bases of columns, and this fact, combined with the columns already known in the treasury of the Atride and one in the basso rilievo of the lions at Mycenæ, tends according to **RANGABE** (in a paper read to the British Association August 1850, and given in the *ARCHITECT Journal*, ii, 400) "to modify the ideas held on Pelagic architecture, and to prove that the principle of the column—containing the germ of the forms developed by the Dorians and Ionians—was, if not an indispensable part, at least an ornament frequently employed in the buildings of Homeric times." The early use of columns by the Greeks is also well treated by **INWOOD**, *Erechtheion*, pp. 33, 35, 39, 40; and the subject has been more recently brought forward by **LEPSIUS** in vindication of Jomard, Rosellini, and Wilkinson, as explained in a paper read by **PAPWORTH** at the Royal Institute of British Architects 30 April and 21 May 1849. *CIVIL ENGINEER Journal*, xii, 185; *BUILDER Journal*, vii, 241, 293.

**COLUMNA.** **PHILANDER**, *Notes to Vitruvius*, supposes this word to mean the king post, *monachus* or *tibicen* (**JUVENAL**, iii) of a roof. There is some confusion in **VITRUVIUS**, iv, 2, between this word and **COLUMEN**. **MATERIATIO.**

**COLUMNARIUM.** A Latin word which has been well suggested instead of **COLLUVIARIUM** in **VITRUVIUS**, viii, 7. **A. A.**

**COLUMNATION** (Lat. *columnatio*). The employment of columns: **APULEIUS**, *Florida*, 18. **INTERCOLUMNATION.**

**COMACENUS.** The late Latin term for a native or an inhabitant of Como. The laws 144, 145, in the Lombardic code of Rothar mention the 'magistri Comaceni' as the builders of that period; **MURATORI**, *Rerum Ital.*, fol., Milan, 1725, i, part 2, p. 25; who also, *Antiq. Ital.*, fol., Milan, 1739, ii, 350,

354, observing that workmen were always to be found in that part of Italy notwithstanding its occupation by barbarians, agrees with **TIRABOSCHI**, *Storia della lett. Ital.*, 8vo., Milan, 1823, iii, 218.

**COMBACONUM.** A town in the province of Tanjore in Hindostan, and the later capital of the Chola dynasty. **FERGUSON**, *Pict. Illust.*, fol., London, 1847, pl. 20, states that he could not discover more than one-fourth of the forty temples said to exist in this city, and giving a vignette of one of their gopuras, asserts that all these buildings are later than the porch of the temple of Sri Rama, of which he gives an interior view, dating it about the end of the seventh century.

**COMBE DOWN STONE**, see **BATH STONE**.

**COMBINATION ROOM** and **COMMON ROOM.** The former term is used at Cambridge, the latter at Oxford, to designate the room in each college to which the fellows and guests of the upper table withdraw after dinner for wine and dessert. The room is also used (like a cathedral chapter house) when the master and fellows meet in their corporate capacity to transact collegiate business, or to execute such instruments as may require the college seal.

The best arrangement for the combination room is between the master's lodge (with an entrance for the master on that side) and the upper end of the dining hall, with an approach from the dais for the fellows; in this respect it may be compared with the presence chamber in an old English baronial residence. A small retiring room with lavatory, and rooms for the wine-butler or manciple are desirable adjuncts. **R. R. R.**

**COMBUSTION.** The chemical action which takes place when the elements of a body combine rapidly with the oxygen of the atmosphere, accompanied by the evolution of heat, and usually of light, though the latter phenomenon appears to depend upon the rate at which such combination is effected; for as flame is not visible unless the gases attain a temperature of between 500° and 600° centigrade, the combination when effected slowly does not allow the temperature to be sufficiently raised for flame to appear. The character of combustion, therefore, is greatly influenced by the quantity of caloric evolved during the combination with the oxygen, and may be either slow and dull, or rapid and brilliant; as in the case, for instance, of iron, which burns rapidly in pure oxygen, whilst it is consumed slowly in ordinary atmospheric air, or is said simply to rust. Bodies which combine easily, in consequence of their mutual affinity, give off heat, and at times even approach incandescence; but properly combustion cannot be said to take place unless the elementary substances shall have entered into combination with oxygen. Many substances, however, are consumed as before stated without the manifestation of light, especially if they do not contain anything volatile. Every combustible substance, in fact, requires a determined temperature before it enters into brilliant combustion, and below this it ceases to burn visibly.

Spontaneous combustion may therefore take place under a great variety of circumstances; and the architect may frequently have to provide against the consequences of the chemical combinations, or of the changes produced in storerooms and warehouses by the fermentation of the articles contained in them; the access of water is frequently dangerous; also bubbles in glass, etc. Fermentation especially is a source of danger; for when it takes place under circumstances producing great heat, flame may be also produced, and surrounding bodies thus brought into a combustible state. A free circulation of air is the best protection against this danger. **WILLIAMS**, *Combustion*, etc., 8vo., Lond., 1854; **PAPWORTH**, *Spont. Comb.*, 12mo., Lond., 1855; **INMAN**, *Spont. Comb.*, 8vo., Liverpool, 1855. **G. R. B.**

**COMMANDERY.** The Knights Hospitalers of S. John of Jerusalem, of the order of S. Augustine, placed upon many of their manors and estates small societies of their brethren, each being under the government of a 'Commander', who allowed it proper maintenance out of the revenue under his care, and



accounted for the residue to their grand prior. The house was in consequence called a commandery or hospital, while a similar establishment belonging to the Templars was styled PRECEPTORY: indeed the latter term was in use with both orders, perhaps because the Hospitalers succeeded 1312 to many of the possessions of their rivals. A few of these cells, or subordinate foundations, had the appearance of being separate corporations having common-seals, but the greater part were no more than farms or granges according to DUGDALE, *Monasticon*, fol., London, 1830, vi, 785, who does not mention the present existence of any such building in a complete state. The order was suppressed in England 1540. COLLEGE.

COMMENES of Mitylene was the architect employed 1810 on the restoration of the church of the Holy Sepulchre at Jerusalem by the Greek clergy, after the fire in 1808: the repairs cost £160,000. WIGLEY, paper read at Royal Institute of British Architects 10 March 1856, p. 109.

COMMESSO (OPERA DI). A system of mosaic work which gradually superseded the *Alexandrinum opus*. It was "formed by slices of marble, arranged somewhat on the principle of the ancient *opus sectile*, the projections of one piece being cut so as to enter into the recesses of another: in that manner it produced, at first, geometrical and conventional forms and patterns, and, at a later period, pictorial representations. When this latter effect was arrived at, advantage was taken of the natural tints of the marble to express shades and local colours; and the work, when fully carrying out the imitative system, became what is generally known by the name of Florentine Mosaic. Limited at first to the monochrome and conventional expression of form, we may trace this art from the church of S. Miniato and the baptistery of Florence, through the works of Giotto at the campanile, Brunelleschi at the duomo, and Orcagna at Or S. Michele, to the singular pavement at Siena, where, through the wonderful skill of Beccafumi, large and elaborate historical compositions may be seen, admirably exhibited in light, half-tint, and shadow, by means of the contrast of three marbles only." WYATT, *Specimens*, fol., London, 1848, p. 17.

COMMITTEE ROOM. The apartment in which the members of committees appointed by Parliament, or other representative or public bodies, meet to transact business. The general principles applicable to all committee rooms are, that they should have good light and an efficient ventilation; that they should be easily and regularly warmed or cooled, as may be required; that they should be of easy access, and yet removed from noise or annoyance from the exterior; and in the case of committee rooms for such bodies as Parliament or the corporation of London, that there should be separate entrances for the members of the committee and for the public. It is important also to avoid any interference with the transmission of sound by the decorations of the walls or ceilings, or by the use of materials liable to absorb or reflect sound; and to distribute the light throughout the room. As wall space is often desirable, it would appear that a committee room would be better if lighted from above than from the side. G. R. B.

A retiring room for consultations is sometimes necessary, and ample size should be provided for the reception of the audience, which if there is no retiring room is compelled to vacate the committee room during the deliberations of the members.

COMMON CENTERING. A centre made without trusses, but having a tie-beam. 2.

COMMON HOUSE, or COMMON ROOM, or COMMON HOUSE HALL (late Latin, *calefactoria domus*, *calefactorium*; Fr. *chauffoir*). The name given to a room, with an engaged or isolated stove, appropriated in a religious or other house as a well warmed place open in common to the inhabitants. At Clairvaux it is on the south side of the cloister between the refectory and the common room under the dormitory; at Cluny it was under the dormitory. Such a room double-ailed and connected by a passage with the dormitory exists, with a fireplace on the west side of the cloister-garth, at the abbey of S.

Agatha at Easby in Yorkshire, of which a plan is given in the (United) ARCHITECTURAL SOCIETIES, *Reports*, etc., 8vo., London, 1852-3, p. 330, b. In the plan of the monastery of S. Gall in Switzerland, given in the *Archaeological Journal*, 8vo., London, 1848, v, 100, another similar room is represented under the dormitory, and was also termed *pyrale* or *pyralis*, corrupted into *pisale* or *PISALIS*, with a fireplace and perhaps a hypocaust, and a passage leading to a lavatory and a bath-house. There is in almost every college in the University of Oxford a common room, or a sort of meeting room in which the fellows assemble after dinner. In some, as New college and Magdalen, there is also a junior common room, where the junior fellows meet. A good description of the use of the common house at Durham abbey may be gathered from SANDERSON, *Antiquities*, 8vo., Newcastle, 1767, p. 80, 97. COMBINATION ROOM.

COMMON JOIST and COMMON RAFTER. The names respectively given to the small joists in any floor, to which the boards of the floor are nailed; and to the small rafters on which the battens or boarding of a roof are fixed.

COMMONS. The name given to bricks made out of common earth, that is earth which is not *malin* earth by nature or by the admixture of chalk, etc. Common bricks, according to their quality, are either stocks, half and half (grizzles), or place. BRICK, p. 140. A. A.

COMMUNION TABLE. The table at which communicants partake of the Lord's Supper. ALTAR.

COMO. A city in the government of Milan in Austrian Italy. It is surrounded by double walls with towers, and has four lofty fine mediæval gateways. The cathedral, dedicated 1025 to the Assumption of the Virgin, and cased with white marble from the locality, has had a series of architects, from Lorenzo Spazi, who commenced the nave 50 ft. wide in 1396, as dated on the eastern apse, down to the last century. The clear-story (there is no triforium) is occupied by paintings in imitation of two-light windows under a canopy, but in the crown of each vaulting there is a small circular light; the roof is painted like that at Milan: the aisles, five bays in length, are also vaulted and painted, but have modernized round-headed windows. The western façade, commenced by Lucchino di Milano 1460, of late Pointed character, but having three older doorways and a large rose window of the richest Lombardic character between two tall lights, was completed 1526 by Tomaso Rodario of Maroggia, who designed in a Renaissance style the choir and transepts dated 1513; the cupola by Juvara was erected 1732. An altar in the south transept, and an octagonal baptistery, are ascribed to Bramante; nearly the whole of the outside of the church has been faced with Renaissance work, as also the interior of the transepts and choir (*Illustrations*, Apse). The lateral doorways are by Rodario, that on the south-west dates 1491-1509. The choir seats behind the altar, the ambo next the south-west pillar of the lantern, and the two organs dated 1596 and 1650 in the eastern arches of the nave, deserve notice. The chiesa prepositurale di S. Fedele is transverse triabsidal, the five-sided eastern apse having a large open external gallery; the transepts end in three-sided apses with external aisles; the octagonal lantern surrounded by small external galleries carries a dome; and in each of the two internal galleries for females is an organ; the north doorway is much praised. Of the eleven other churches, those of Sta. Croce and S. Giovanni are chiefly remarkable for their antique marble columns. The large cross-church of S. Pietro Celestino, in a Renaissance style, has also two organs. Near the south-west of the cathedral is the *broletto* or town hall, 1215; a view shewing the *ringhiera* or balcony, but omitting a third floor added within late years, to the original two storied building having a loggia

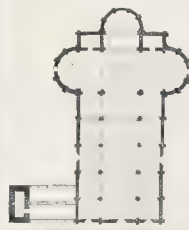


FIG. 1. CHURCH OF S. P. CELESTINO.

of four pointed arches below and semicircular arches above, is given in STREET, *Brick and Marble Arch.*, 8vo., London, 1855, p. 232. Among the other buildings the best are the amphitheatre, the theatre, the new casino, the *liceo*, 1824, the *seminario*, and five large schools. The suburbs contain many good public and private edifices; among the latter are the villa Odescalchi or Raimondi, or dell' Olmo, and the palazzi Baldovini, Barbo, Resta, Rezzonico, Grumello, Salazar Gallio, Villani, Carminati, Visconti, etc. The suburban Lombardic church of S. Abbondio, formerly cathedral, but now a *seminario*, has five aisles with no clearstory lights to the nave, but having them to the middle aisles, the bays being segment-headed arches; it has a semicircular apse and a square tower; on the north side is a large cloister of three stories in height. CERSOLA, *Storia*, 8vo., Como, 1808; CICERI, *Notizie*, 4to., Como, 1815. The inhabitants have been travelling masons from a remote period; COMACENUS. 14. 28.

The quarries already mentioned supplied in 1820 six monolithic columns, 18 ft. high and 2 ft. in diameter, for the sanctuary of the Roman Catholic chapel in Moorfields, London.

COMPAGNINI (RAIMONDO), born at Bologna, was a pupil of the Bibiena family, and erected in that city the palazzi Merendonini now Insom, Bianconi now Vaccari, and Tubertini now Cappi (1773 façade only), with the church della Maddalena 1772 from a design by A. Torregiani, and an oratory in that of Sta. Maria delle Muratelle, which church was remodeled by him 1747. He died 1781. 105.

COMPARITION (It. *distribuzione*; Sp. *compartimiento*; Fr. *compartiment*; Ger. *abtheilung*). A term used in English as synonymous with distribution in relation to the division of a place into apartments and passages: but the equivalent foreign terms are applied to the art of symmetrically arranging together various geometrical forms, bounded by straight, curved, or mixed lines, whether intended for glazing, paving, ceiling, etc., or for parqueterie, marqueterie, joiner's work, furniture, etc., or for the plans of streets, gardens, etc. Thus anything divided into several such parts is said to be COMPARTED; and the word compartment is a term that in strictness is only applicable to a subdivisive part, for ornament, of a larger division. 1. 5.

COMPARTMENT CEILING. A ceiling in which the decoration consists of panels not all rectangular but of any other geometrical form, provided that they are not subordinate to any plain area of superior size. Early examples are found in the ceiling of the vaulted building at Rome, commonly called the temple of Peace, and in those at Baalbec; but the employment of compartment ceilings in England dates from the period of bishop West's chapel at Ely cathedral; and designs for such work are to be found in the works of BRETTINGHAM, *Plans, etc., of Holkham*, 2nd edit., fol., London, 1773; CHAMBERS, *Essay*, fol., London, 1759; BASOLI, *Compartimenti*, fol., Bologna, 1827; and most of the other European architects of the first quarter of the present century.

COMPARTMENT ROOFING. An external covering to a roof, in which decoration is sought by a mixture of materials, forms, or colours. 1.

COMPASS HEADED, and COMPASS ROOF. A term formerly applied to a semicircular arch; and to a roof in which the timbers are formed to a similar shape, as some hammer and collar-beam roofs. Some roofs of this sort are lined with boards, or plastered, to form the ceiling into panels. SPAN ROOF.

COMPASS BRICK. The name given to two sorts of bricks; one being of a radiating or wedge-like form in length with flat or curved ends for arches, the other having a curvature in its length with flat radiating ends for steining wells and cesspools.

COMPASSES (Latin, *circinus*, *circulus*; It. *compasso*; Sp. and Fr. *compas*; Ger. *zirkel*). An instrument for measuring or subdividing the distance between two points; and also for describing circles. The term is supposed to be synonymous with 'compassers' as going round the figure of any body; and

is sometimes supplanted by the word 'dividers' in the case of common compasses, formerly called a joint-compass (Fr. *compas à charnière*), which consists of two legs, united at one end by a pin or pivot, and each having a straight or curved steel point. For drawing a circle the lower end of one of the legs is removed and its place supplied by a pencil holder or a pen, and such a pair of compasses is called in French *compas à pointes changeantes*. Other names are made by the addition of an appropriate adjective according to the peculiar make, shape, or use, as beam, bow, elliptic, hair, proportional, triangular, etc., compasses.

COMPASS PLANE. A plane used in joinery having the sole of a convex shape, to smooth any concave faced piece of wood; consequently compass planes must be of various sizes, in order to accommodate different diameters. PLANE.

COMPASS SAW. A very narrow saw, without a back. It is used to divide boards into pieces of curved outline. 1.

COMPASS TIMBER, see BENDING TIMBER.

COMPASS WINDOW, and COMPASS BAY WINDOW. The first of these terms is applied to a window planned so as to form a circular or segmental recess out of a room; the second to a square BAY WINDOW with a similar recess.

COMPENSATION. In surveying, the amount of money to be paid by public bodies for dispossessing any person of his property by force of any legal power, and taking it for their own purposes. Although it is just that in most cases individuals should give way for a public good, yet it is equally just that the many should pay liberally for what is taken; because a sum of money divided among a large body presses very lightly on each, while it is of vital importance to a single individual.

The theory of the law on this subject in England has always been understood, and the means suggested to carry out that theory through the intervention of a jury in the event of dispute, is consistent with our habits as a people, as well as our jurisprudence. The first great necessity for the interference of the law with private property arose after the Fire of London, where, though the principle of reinstating every man in his possessions was admitted, still the necessities of the case demanding the compulsory purchase of property for public improvements, an Act of Parliament was passed. A body of commissioners was appointed, all lawyers, whose portraits now adorn the exchequer chamber at Guildhall: to this commission this duty was entrusted, and with the assistance of the city surveyors (the most eminent of whom was Jarman, the architect of the Royal Exchange of that period), it appears to have been most laboriously and honestly performed. The decisions of the commission are preserved in the British Museum, Addit. MSS. 5063-5103. It is certainly unfortunate that the claims of individuals prevented the possibility of adopting the plan of rebuilding the city as proposed by Wren, or even that of Evelyn.

PEPYS, in his *Diary*, vol. iv, ed. 1848, p. 282, under the date of 3 Dec. 1667, gives some curious particulars of the "new street that is to be made from Guildhall door to Cheapside", and relates that the "ground is already most of it bought." This is the present King-street. Pepys' informant on that occasion was Sir Richard Ford, who gave him the following curious particulars:—"He tells me of one particular, of a man that hath a piece of ground lying in the very middle of the street that must be; which, when the street is cut out of it, there will remain ground enough of each side to build a house to front the street. He demanded £700 for the ground, and to be excused paying any thing for the melioration of the rest of his ground that he was to keep. The court consented to give him £700 for the ground, only not to abate him the consideration; which the man denied; but told them, and so they agreed that he would excuse the city the £700, that he might have the benefit of the melioration without paying any thing for it. So much some will get by having the city burned! Ground, by this means, that was not 4d. per foot before, will now when houses are built be worth 15s. a foot. But he tells me of the



common standard now reckoned on between man and man, in places where there is no alteration of circumstances, but only the houses burnt, there the ground which with a house on it did yield £100 a year, is now reputed worth £33:6:8; and that this is the common market price between one man and another, made upon a good and moderate medium."

This detail contains a reference to that peculiar clause in this first Improvement Act which compelled a party whose ground was improved or "meliorated" by any change to contribute the increased value to the common fund. In this extract PEPYS shows one of the great improvements effected; but in the same volume, p. 36, under the previous date of 5 May 1667, it will be seen that an improvement only recently partially effected in New Cannon-street was then proposed, perhaps ordered, but unfortunately not carried out. The extract is as follows:—"Sir John Robinson tells me he hath now got a street ordered to be continued 40 ft. broad from Paul's through Cannon-street to the Tower, which will be very fine."

Subsequently to the Fire of London arose the minor cases of Westminster and Blackfriars bridges; and (in 1765?) the commissioners of the sewers of the city of London obtained power, in the event of a house being pulled down, to compel the owner to set it back or round it off upon compensating him for the injury. The owner, however, possesses the counter power of compelling them to take the whole of his property; and then follows this absurdity, which ought to be remedied, that they are bound to offer the land again to the former owner, who compelled them to purchase, and in every step the costly introduction of a jury may be demanded. This latter provision of the right of preemption does not exist in any other case of building land taken compulsorily for public purposes, and has prevented many improvements in London which would otherwise have been effected.

In the year 1823 the first Act was passed for the rebuilding of London bridge and for effecting the improvements rendered necessary thereby; and by this and subsequent Acts of a similar nature, the principles of the compulsory purchase of property were fully established. For some years the clauses for obtaining property compulsorily, as introduced into the Acts of the city of London, were the model of the cloud of Acts which followed for obtaining land for railways, though in the latter case, in the agricultural districts, the precedents afforded by the canal Acts had been generally followed. These Acts differed, however, in course of time very greatly from one another, and as their differences became inconvenient to the courts of law and generally undesirable, a statute was passed 8 Vict. cap. 18, called "the Lands Clauses Act", and this Act is now incorporated into all Railway Acts or Acts for public improvements, with one notable exception that the city of London refuses this incorporation, and abide by their own clauses, and in the Bill brought in for the improvements in connexion with the new public offices in Downing-street, an entire new set of clauses was introduced.

Leaving, then, the exceptional case of the city of London, the course usually taken, whether for improvements or any public purpose, at the present time will be briefly described.

Before the 30th November in any year, according to the standing orders of the Houses of Lords and Commons, notice is required to be given three times in the *Gazette* and the metropolitan or local papers, describing generally but most accurately what is intended; as in a railway the extent, the course of the line, the commencement and termination, the parishes, townships, and counties interfered with. Subsequently to this, and before the 30th January following, plans, sections, and books of reference must be deposited with the town clerks, clerks of the peace, and other public authorities, and notice served on every owner, lessee, or occupier of every property touched, with a plan and section, or other complete indication of what is required and intended. A personal canvass of every individual must also be proved, and his answer, whether assenting, dis-

senting, or neuter or indifferent to the project, recorded and returned. When Parliament assembles and the Bill is brought in, these documents are all referred to the committee on standing orders, before whom any one objecting to any error in any of these technicalities may appear, and if the plan or section be wrong, or the property be wrongly described, and negligence is shown, the objections to the Bill are fatal, and as it is called 'the Bill is thrown out for non-compliance with standing orders'. If the errors are venial or accidental, the Bill is allowed to proceed, and if opposed it is sent to a special committee of five independent members, or if unopposed to the chairman of committees; but in either case the intentions of the promoters of the Bill and its clauses are clearly shown in the report to the House. The Bill may be opposed by any one having his land interfered with by petition, and he may appear by himself, his agent, or counsel, and with or without witnesses: sometimes rival companies may obtain what is called a *locus standi*, and appear as opponents, but generally the opposition is managed through a landowner, whose consent to such a course is purchased or his expenses guaranteed by rivals, or he really appears opposing for himself on some valid objection. The same ordeal was until very lately required in the House of Lords; by a recent regulation, however, one examination on standing orders has been made sufficient for the same Bill. If the facilities for opposition are very great, the temptation for litigation are equally so. Before the House of Commons committee there is a great latitude allowed, and it is by no means uncommon to have a Bill before a committee of that house twenty or thirty days, or, as in the great fights of the Great Western and the South-Western, double that period. The House of Lords cut the matter much shorter, but they consider with great favour the opposition of any great or influential landowner, and when this arises the Bill is sure to be thrown out, or any terms agreed upon between the parties which avarice or prejudice or caprice may dictate. From this statement it may easily be understood why the law expenses of obtaining Railway or Improvement Acts are so great.

In the way thus described power to purchase property of all kinds compulsorily has been obtained, and the importance and extent of the powers thus conferred, may be proved by the fact that for railways alone the sum paid for land and costs, as stated by Capt. Galton in his Return to the Board of Trade in the autumn of 1857, has amounted to the enormous sum of seventy seven millions sterling.

With the exceptions before adverted to, the purchase of lands compulsorily is now placed under the provisions of the statute 8 Victoria, cap. 18, "the Lands Clauses Act". In this it is enacted that "in estimating the purchase money, or compensation to be paid, regard shall be had not only to the value of the land (which by the interpretation clause is extended to all other hereditaments, but also to the damage, if any, to be sustained by the owners of the land by reason of the severing of the lands taken from other lands of such owner; or otherwise injuriously affecting the same." The assessment of these items must depend entirely on the experience and knowledge of the parties called in. The amount, however, is now usually constituted of these heads:—1. The value of the property taken. 2. To take any reversionary or prospective advantage the owner may be likely to receive at any time, and to estimate this advantage in present money. 3. To claim for any advantage the owner or occupier may have by carrying on any trade, business, or profession, in that locality, whether the same would be utterly destroyed, or whether it or any portion of it might be removed and carried on at another place, and if so at what cost or loss. 4. The cost or charge of removing the stock, furniture, or other property, or the loss on the same if compelled to sell them by auction, to make way for the others to enter. 5. If a portion only of the property be required then in addition to the value of that taken, the estimated amount of damage the remainder may sustain (in the words of the Act) "by reason of the execution

of the same", i. e. the carrying out of the undertaking. This is usually called 'CONSEQUENTIAL DAMAGE'. 6. If a portion only of the property be required, and that portion should injuriously divide the remainder of the property, the estimated amount of damage which is known as 'severance'. 7. A compensation for a man's loss of time, trouble, and expense, in finding a new investment; loss of interest; the parting with property he is attached to and has an interest in, such as patrimonial property; and other losses by being forced to give up his property and seek new. This forms the item of 'COMPULSORY SALE'.

These are the technical items, but with the involved interests which must necessarily arise in such a highly civilized, almost artificial state of society as ours, the feeling of right and wrong is still the best guide. A man who is forcibly dispossessed of his property should be entirely reinstated, or as the lawyers say "recouped", and no more. The best test would be that both parties should be able to say a twelvemonth after the settlement—"Well! the dispossessed owner is now in every respect we can take into account, neither better nor worse off in worldly welfare than when his property was taken from him by the act of the company."

In the application of these principles, the experience of life must form the basis of any just arrangement, and there can be no doubt that the *market value* or the price that would be paid by a willing purchaser to a willing seller must constitute the first element. Collateral or consequential injury must of course be always matter of opinion to a considerable extent; but at this period there is considerable experience even on that subject, and the result of that experience is that the general views of damage and injury have been greatly exaggerated. The market value of all property appears to depend upon three distinct principles, viz. the permanency of the security, the facility with which the usufruct whether rent or interest is collected, and its convertibility. Government securities, which combine all these advantages, are the dearest investments in England. Land comes next, and though this is deficient in the qualities of facility and convertibility, still these are qualified by the common feeling of a desire for territorial possession arising from the advantages which this qualification presents, either socially or politically. Next to land, follows land occupied either partially or wholly with buildings, perishable though costly in their nature. In this way freehold land in favourite counties produces thirty years purchase on a fair net rental; in less favourite counties, as Essex, twenty-eight years purchase. To this in the case of estates must be added a reasonable value for buildings, though this unfortunately is generally a sum far short of their cost.

In the case of the houses, the only criterion of value is the rent. A good freehold house in a city or town, let on lease at a fair rack rent, will produce always twenty years purchase, and sometimes a little more, and this number of years purchase diminishes as the house is older, or let from year to year, to a tenant at will, or to monthly or even weekly tenants, or in the country. Leasehold interests created short of the freehold, even of the very best kind, are uniformly sold to pay 6 per cent. at the least on the improved rent, and when the term is short and the ground or reserved rent heavy, can only be sold at prices enabling the purchaser to secure 8 or even 10 per cent. Ground rents, if freehold, are valuable in proportion to the extent to which they are covered by the rack rent and by the period of reversion. A good ground rent ought to be six times covered, that is, the rack rent ought to be equal to six ground rents. A reversion, however, unless within forty years, is not much taken into account. The ground rents of the city of London sold on the average at thirty-one and a quarter years purchase, the reversion being between eighty and ninety years; but it must be recollected that these were principally bought by the owners by sealed tender, and at a favourable time as regards the state of the money market. Some of these ground rents, so high as only to be covered three times by the rack rent, were sold for twenty-five years purchase.

ARCH. PUB. SOC.

Taking thirty years as the maximum, other ground rents, freehold and leasehold, can only be valued according to locality, circumstances, length of holding, etc., and no general rules can be applied. Goodwills seldom actually appear before the public, as they are matters of private arrangement. The goodwill of a public house generally obtains three years actual profits, in addition to the fair value of the house, and probably one year's net profit may be assumed as the selling price of purely local trades, such as butchers, bakers, tobacconists, and a few others. In point of fact, goodwill in situations well adapted for retail trades assumes the shape of rent, and gives the value to situation; and it must always be recollected that when a man sells his business he covenants to give it up entirely or not to carry it on in the neighbourhood, neither of which circumstances apply in a removal for public purposes.

It is not possible to show the application of these principles very extensively, because the infinite modifications of property and its tenure cause each case to require a different application of the principles themselves. It may be convenient, however, to explain the *modus operandi* in compulsory purchases; and what is about to be described applies to all compulsory taking of land for public purposes, whether railways, improvement of towns, or otherwise, wherever the powers of the Lands Clauses Act are introduced. The sort of notice required previously to the introduction of a Bill has been explained; but when the property is really required, an exact notice must be given, describing accurately (with a plan if necessary) what is wanted. This notice is by law a contract for the purchase of the land, it cannot therefore be abandoned by the company, nor changed in any manner; even if the project be abandoned, the party upon whom the notice is served can still compel the purchase of the property comprised in the notice. Additional notices can, however, be given for additional or supplementary property. The person to whom notice is given, if that notice requires only a part of a house or manufactory, can give a counter notice, and compel the company to take the whole; or if the quantity of land severed is very small, the seller can also compel the severed portion to be purchased; but the buyer also, actually wanting only a part of a house or building, can take the whole, and can compel the owner to sell it.

When a railway or improvement is completed, surplus lands cannot be held beyond a certain period, generally from seven to ten years; and the previous owner or the adjoining owner has a right of preemption if it be land, but in the case of houses or buildings, or building land, there is no right of preemption reserved. Trustees who are compelled to invest the purchase-money or other similar property, can do so subsequently, and obtain the expenses from the companies or corporations. All these points are now matters of well established law; cases and authorities in proof need not therefore be quoted, but the further proceedings for buying or selling land compulsorily, subsequently to the notice, will be at once described.

Parties on whom notices are served are called upon within a certain period to return an answer stating the full particulars of their interest and the sum they claim, and a blank schedule is usually forwarded with the notice, explaining the particulars required; that is, whether the property is freehold, copyhold, lifehold, leasehold, or otherwise, stating term of years, customs of manors, lengths of lives, and other particulars. The value of the interest of the property itself is not generally very difficult to arrive at, except in cases where the land is near a city or town, not building land in fact, but either approximately or remotely likely to become so. This is a disturbing element of great influence, and leads to much of the difference which arises in estimating the value of such property. As before explained, thirty years may be considered the maximum number of years purchase, decreasing in the case of leaseholds, lifeholds, or copyholds, in proportion to their nature and duration. To the total value, 10 per cent. is always now added for compulsory sale of any thing in the nature of buildings or building land. On the



value of agricultural land the compulsory sale addition is 20 per cent. at the least, but it is now very often the practice to add 25 per cent. With regard to collateral or consequential damage or injury in land, the most obvious item is actual severance, by which a field is cut in two and its cultivation made more expensive by reason of short ploughings, or even the necessity for hand labour only. This is a question of fact, and can only be determined by experience; but the diminished rent or value and the acreage having been determined, the same number of years purchase is allowed as for the land itself, and apportioned fairly between the owner and occupier. By a clause in the Act any reserved rent may be apportioned, and in the event of dispute that apportionment is to be decided by the magistrates in petty sessions, as are also all communications or bridges, whether on the level or over or under a railway, or the supply of watering-places for cattle. Sometimes it is found necessary to pull down or reconstruct farm buildings, or farm houses, or premises; in these cases the actual cost is to be ascertained and added to the compensation, but of course for all collateral or consequential damage the fact is to be ascertained and liberally taken, but no "compulsory sale" is added.

In addition to claims for actual severance, general severance arises. This is the injury to prospect, approach, communications, or other advantages, and claims of large amount are often made because of the real or fancied injury caused by a railway passing through an estate. The word 'fancied' has been used, because experience has shewn that these claims are often not well founded, and the disposition of juries and arbitrators to allow large sums for this kind of injury has become much modified. To complete the claims on agricultural land, actual crops or dressings, etc., have to be added, "according to the custom of the country"; but there still remains the question of the farmer's profit, and this is a fertile subject of dispute. At the present time it is allowed as a general rule that a farmer's net profit is, acre for acre, the same as his rent. If he is a tenant from year to year, as he generally is, one, or at the most two, years profits are paid, depending, however, on the time of year at which the land is taken; but where there is a lease of any length, the tenant-farmer's profit so taken is an absurdity. Many cases have been known in which nearly the fee simple of the land has been thus claimed as net profits. Thus a forty years lease, by the 5 per cent. table, is worth in present money 17-16 years purchase, a perpetuity at that rate being only twenty. The right rule in such cases would doubtless be to consider tenants' profits, like all such interests, as extremely fluctuating, and contingent upon many circumstances. In many cases, it is of little consequence to a farmer to take a few acres of his land; in others it is much more important, such as when grazing land which he cannot supply is taken, or such a quantity of his farm as leaves him with the same number of horses and men with less land, these and such like circumstances must be fairly considered and fairly allowed for; the number of years certainly forming an important element, but not the principal one, as at present.

House property leads to considerations of great importance connected with the purchase of trades. Mere questions of occupancy are often greatly exaggerated. Compulsory purchasers are compelled always to take tenants' fixtures; to pay for damage and loss by fitted furniture, but not to take it; to pay for the actual expenses of removal, and damage to furniture by such removal. In cases of trade the same rules apply; the purchaser is compelled to take tenants' fixtures, but not plant or utensils; but the removal, refitting, or reinstating the plant, must be paid for in addition. In retail trades the net profit due to locality is ascertained by an accountant, and generally one year or at the most one and a half year's profits are paid. In wholesale trades the actual loss and inconvenience, on the principle of a fair removal, must be ascertained, and that sum added. As to retail trades, it is generally noticed that the parties find some place in the neighbourhood where they replace themselves;

and in wholesale trades, by a little forethought and forbearance, removals without great loss are effected: but experience in Paris, as well as in London and generally in England, has shewn that both these classes of claims are greatly exaggerated both as to extent and injury.

The only point remaining is to shew the mode of settling the claims for property. Generally the surveyors of the parties meet the surveyors of the company, and either by mutual explanations, or the friendly assistance of some well known associate, agree without expenses and without difficulty. The very ablest architects, from the time of Sir C. Wren downwards, have been engaged in these negotiations; and in the present day such men as Nash, Smirke, Hardwick, Tite, and Pennethorne, have been largely engaged in such matters. In this friendly way, or *à l'amiable* as the French phrase it, much of the most important of these purchases are made. In the event of difference, however, the course is more difficult, and sometimes the litigation and expenses may be made something quite enormous. If the matter presses, and the lands are immediately required, compulsory possession may be obtained by applying to two magistrates, or a police magistrate, who can appoint an independent surveyor, who is sworn to make a fair valuation; the amount of that valuation having been paid into court (or without that process if the purchasers choose to deposit the total amount of the claim), and a bond given to appear before a jury when called upon, possession of the land may be taken. If after this, however, the dispute continues, the seller or claimant can demand from the purchaser to have his claim settled by a jury or a reference. If the purchaser fails to take the necessary steps to do so in proper time, the penalty is the paying without appeal the total amount of the claim.

The proceedings before a jury are exactly the same as any other trial. On a *precipe* being issued to the sheriff, he summons a jury in the usual way, the seller being entitled to all the rights of a plaintiff in the Court of Queen's Bench, including summing up the evidence. If the sheriff or the parties require it, a queen's counsel is appointed assessor. The verdict is final in all cases, and if it be the same or a less sum than the purchasers offered previously, a portion of the costs fall on the seller; but if more, then all the costs fall on the purchaser.

In the case of an ARBITRATION each party appoints an arbitrator with power to nominate an umpire. If they cannot agree as to the umpire, the Board of Trade is applied to, and has power to make the nomination. The court thus constituted proceeds formally to hear the case, and is attended by counsel, solicitors, and witnesses. This course of proceeding often lasts many days, and is exceedingly harassing and expensive. It falls heavily on the purchasers; but at the same time the sellers are great losers, because the costs are strictly taxed, and the difference is often very considerable. This apparently reasonable power of choice of tribunal given to sellers, is however often much abused, and requires some modification and amendment; for example, Mr. Tite, in his evidence before the committee of the House of Commons, May 5, 1855, gives a case where the question was of a very simple kind. The meetings were spun out to twenty-three days. Sir Fitzroy Kelly and other eminent counsel were employed by the seller; and the fee charged by the umpire alone was 600 guineas. It was ascertained that the costs of this reference, simply to determine the expense of the interference with a small wharf and an unimportant brick field, could not have been less altogether than £7,000. The possibility of such cases may well explain the determination of the corporation of London to abide by their own Acts, in which no such right of demanding an arbitration exists: it has, however, always offered an arbitration in the case of freeholds, and doubtless the proper mode of determining the value of property is by the umpirage of an experienced surveyor, before whom all facts should be proved, leaving to his own judgment and to the representations of the professional arbitrators the question of the value. If this course

were taken the expense of an arbitration, which is the only present object, would be avoided.

Besides the statutes mentioned by PULLING, *Laws, etc., of the City*, 8vo., London, 1854, pp. 308-319; and the forms from the Companies, Lands, and Railways, Clauses Consolidation Acts, respectively found in the 8 and 9 Vict. 16, 18, and 20, given in HODGINS, *Law of Railways*, 8vo., London, 1855; the Acts 44 George III, c. 95, and 49 George III, c. 112, for the Defence of the Realm; 7 George IV, c. 78, for the Westminster Improvements; and those ranging from 53 George III, c. 121, to 9 George IV, c. 70, for the new (Regent) street, may be consulted for information as to the provisions for compensation which have been from time to time adopted by the legislature.

COMPENSATION is also the term used for an amount to be paid to a landlord for dilapidations suffered or not properly restored by the tenant.

Besides these uses of the word, it also designates remuneration for time lost under an engagement when the performance of services has not been demanded; and the amount payable, in some cases where work is stopped, in lieu of the reasonable profit that would have accrued to the person engaged.

COMPETITION (Fr. *concours*; It. *concorrenza*). The attempt on the part of two or more persons, each to obtain for himself an offered prize, or other object of their study, research, or calculation; and the provocation of this attempt is the mode by which a person or a committee endeavours to obtain the best design for a given work in architecture.

The proposers of competitions can prescribe any terms they think fit; whatever they may be, they ought to be clear and explicit; the objects to be attained cannot be too explicitly described; the means of attaining them should be left as much as possible to the architect; professional advice is desirable in the formation of the preliminary instructions, as well as in the decision on the merits of the designs; the maximum amount should be stated, and proper means should be employed to ascertain that the cost of executing the design will not exceed the estimate; all the drawings should be made to one scale, limited to one style of finishing, as Indian ink or sepia, except as may be requisite to distinguish different materials in the sections; and the perspective drawings should be limited to specified points of view.

In the case of buildings, it is desirable that competitors be furnished with an exact plan of the site; particulars as to levels, and depth of drainage; a description and current prices of the building materials used in the locality; a photographic view of the site and vicinage, from the specific point of view from which a perspective view of the proposed building is required, would often be advantageous. An extravagant expense to the competitors might be avoided by directions that sketches only should be submitted at first for selection by the judges, as was the case for the Liverpool Library and Museum, 1856. The competitors themselves might be entrusted with the choice—allowing to each two votes only—whether submitting one design or more. Report of the Committee of the Institute of British Architects, on *Public Competitions for Architectural Designs*, submitted 24 January 1839. Report on *Architectural Competitions*, read at a meeting of the Architectural Association 4 October 1850. The history, which is sufficiently disgraceful, of modern architectural competitions, must be sought in a perusal of the columns of the professional journals.

COMPLEMENTARY COLOUR. The colour which is produced on the retina in order to satisfy the eye by supplying the place of the deficient actual colour requisite for harmony; thus blue, red, or yellow are complementary to orange, green, or purple; and the reverse. This colour has been called ACCIDENTAL COLOUR by BUFFON and since his time, but the word complementary has been invented to prevent confusion.

COMPLUVIUM. This Latin word is generally explained as "an area in the centre of the ancient Roman houses, Suetonius, *Aug.*, 92, so constructed that it might receive the water

ARCH. PUB. SOC.

from the roof"; and also as "the gutter or eave of a roof": whereas it really means the open space left on the level of the eaves in an atrium *impluvium*, because the rain water was brought together there and dripped into the impluvium. VARRO, *De L. L.*, v, 161; FESTUS, s. v. Impluvium. ATRIUM; CAVEDIUM; IMPLUVIUM.

COMPO. A common but very inappropriate name, given originally to artificial cements called compositions by the inventors, and afterwards to any natural or artificial cement used for coating brickwork. The 'compo' of frame-makers is a COMPOSITION. BADIGEON: CEMENT. G. R. B.

COMPOSED CAPITAL. A name for any capital different from those recognized as strictly appropriate to the classic Doric, Ionic, and Corinthian orders, or their modern imitations, and those called Tuscan and Composite. Some of the best antique Greek examples of such a variation (consisting chiefly in the use of foliage with sometimes the omission of the cauliculus) have been collected by MAUCH, *Neue Systemat. Darstellung*, 4to., Potsdam, 1845; while many of the antique Roman fancies of birds, fish, heads, horns, monsters, etc., are given in PIRANESI, *Magnificencia*, fol., Rome, 1761; others occur in CHAMBERS, *Treatise*, fol., London, 1791, s. v. Composite Order, and in the works of the architects in Europe of his period. 5. 25.

This system of decoration in capitals was probably springing up in the time of VITRUVIUS, for after treating of the three orders which he recognizes, iv, 1, he adds that "there are other sorts of capitals called by various names which are placed on these columns."

A. A.

COMPOSITE, sometimes improperly written COMPOUND,

ARCH. A name sometimes given to a pointed or lancet arch; but better appropriated to four-centered arches; and still better confined to those variations of shape given to the heads of apertures in which an arch would generally be employed, as are seen at the mosque of Touloun at Cairo. HAY, *Cairo*, fol., London, 1840; KALLENBACH, *Atlas*, etc., fol., Munich, 1847.

COMPOSITE ORDER. This, as its name imports, is a compound of the Corinthian and Ionic orders; for the entablature may be either Ionic or Corinthian, while the capital is an angular Ionic one with two rows of leaves taken from the Corinthian and placed under the volutes. The courtyard, called a peristyle, of the house of Pansa at Pompeii has two columns still complete: these are fluted, except for about one-third of their height from the bottom; are made of a volcanic stone; and with their capitals are of good execution. But they have been covered, probably after the earthquake A.D. 63, with a hard stucco, and large leaves of the same material have been set up under the volutes of their Ionic capitals, so as to transform them into a sort of pseudo-Corinthian or Composite order. Besides the well-known examples at Rome in the temple of Bacchus, the arches of Septimius Severus, of the Goldsmiths, and of Titus, and the baths of Diocletian, given in TAYLOR and CRESY, *Antiq. of Rome*, examples may be traced throughout the eastern portion of the Roman imperial dominions, of which perhaps the finest is that at Myra, given by TEXIER, *Desc. de l'Asie Mineure*, fol., Paris, 1839, iii, 208, 238, pl. 220, 221, the entablature has an architrave of three faces, a richly sculptured pulvinate frieze, and a cornice with dentils under modillions: there is also a pilaster with a corresponding capital. Palladio, Serlio, Scamozzi, Vignola, Chambers, and others, have all respectively given canons for the proportions and profiles of this order.

COMPOSITION. "Composition means literally and simply putting several things together so as to make one thing out of them, the nature and goodness of which they all have a share in producing—an intended unity must be the result of composition"; RUSKIN, *Elements of Drawing*, 8vo., London, 1857.

COMPOSITION in any work of art expresses the combination or grouping of the design, so as to produce a result in one





general idea, homogeneous in itself and consistent in all its parts. In architecture it applies equally to the plan, elevation, or section, to the whole or to any one feature or detail; as a portico, tower, doorway, window, the order or even the moldings of a cornice. Proportion, propriety of application, harmony in grouping, contrast, the general relation of the parts to each other, due subordination to the leading feature, and correctness of style, are leading considerations in composition.

T. L. D.

**COMPOSITION FOR ORNAMENTAL WORK** (Fr. *pâte*). The name given to a sort of putty, consisting of whiting, glue, linseed oil, and resin, subjected for two hours to the action of steam, and forced by great pressure into wooden, metal, or other moulds. **CARTON PIERRE. CEMENT.**

Perhaps the earliest recipe is to be found in *Stalker, Japanning*, etc., fol., Oxford, 1688, p. 61; who details its application. One in present use is given in *SMEATON, Builders' Manual*, 16mo., London, 1847, p. 125.

**COMPOSTELLA** in Spain, see **SANTIAGO DE COMPOSTELA**.

**COMPOUND**. This word, probably a corruption of the Malay term 'campong', a village, alluding to the houses of the servants which are erected within the enclosure of a property, is applied all over British India (where, however, it is supposed to be derived from the Portuguese word 'campania'), to each enclosed piece of land on which a mansion is built: it is generally planted with shrubs, and has a circular carriage drive from the gates to the door of the house. **EARL, Eastern Seas**, 8vo., London, 1837, p. 16.

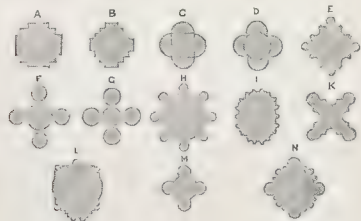
The partition with an open top, whether balustraded or not, in London counting-houses, is sometimes called a 'compound', a term probably introduced by European merchants returned from India.

G. A.

**COMPOUND ARCH**. A term explained by **WILLIS, Remarks**, 8vo., Cambridge, 1835, p. 26, as a series "of concentric archways successively placed within and behind each other"; which is otherwise described by **PALEY, Manual**, 8vo., London, 1845, p. 10, as an arch of as many orders as there are successive planes or retiring arches between the face of the wall (which is counted) and the soffit of the inmost arch.

**COMPOUND GIRDER BRIDGE**, see **GIRDER BRIDGE**.

**COMPOUND PIER** and **COMPOUND PILLAR**. The terms applied when a central mass or body receives small piers, as at *A* and *B*, or pillars, with shafts usually of uniform height, to describe the angular or circular principle of the plan of such a central body. In the case of clustered shafts, the use of the proper term describes at once whether they are semicircular, as *C*, or more than half round, as *D*. Compound piers with *grouped* (disengaged) shafts, as *E*, were less common in the first periods of Mediæval art than compound pillars with such shafts, as *F*, *G*, and *H*, from Canterbury, Salisbury, and Lichfield cathedrals



respectively. In Romanesque and Pointed edifices, however, compound piers with *engaged* shafts, as at Rochester, at Norwich, cathedrals, *J*, and at Cogenhoe, *K*, etc., are as frequent as compound pillars with such shafts, of which the examples here given, *L*, *M*, *N*, are respectively from Norwich, the Temple church in London, and Dorchester church in Oxfordshire. The central pillar is sometimes seen in the Flamboyant style; but in Perpendicular, as in Second Pointed work, the pier is the

usual groundwork, and the plan, *K*, with its hollows flattened, becomes a very common type. **WILLIS, Remarks**, 8vo., Cambridge, 1835, p. 24, uses the term *clustered* for all these conditions.

**COMPOUND VAULTING**. The name given to such vaulting as that in the chapel of Henry VII at Westminster abbey, and in other places, where the construction appears to depend upon a pendant placed on each side, and within, the walls that carry the main vault.

**COMPRESSION**. The state of a given quantity of matter while being forced into a smaller compass than is natural to it. Gases, and spongy or some descriptions of cellular bodies, are those which are most easily compressed; whilst liquids resist such reduction: water, indeed, is only compressed 0.000045 by a weight equivalent to 15 lbs. on the square inch. The most important of the bodies usually employed for building operations may be considered generally speaking to be incompressible for all practical purposes, or at least they must be employed under such conditions as to prevent any uncertainty or inconvenience from this cause. In this class of substances the cohesive properties of the molecules occupy a distinctly opposite relation to their powers of resisting compression; that is to say, the building materials which are the more easily compressed are also those which are characterized by their greater cohesion, whilst those which resist compression with greater energy are entirely destroyed in their molecular arrangement, directly the compressing force exceeds the inherent powers of resistance. Bodies may be compressible without being elastic, but in this case they become denser after compression, and they resist compression according to their peculiar law, nature, and form; and it may be stated as a general rule that, when the form is long, the resistance to compression is in an inverse ratio to the width. The compression of gases is often accompanied by a sensible evolution of heat; that evolved by the compression of solid bodies is hardly perceptible. **COHESION; CRUSHING WEIGHT.**

The compressibility of foundations depends on the nature of the subsoil, and the possibility of any lateral displacement of the surface strata. In the case of alluvial and diluvial clays, for instance, it often happens that beds of peat, or strata of various kinds charged with water, occur under the clay; and if under such circumstances the peat can spread laterally, or a vent be given to the waters, the clay will certainly be displaced, and even it may be dangerously, because unequally, compressed. The lateral displacement of the subsoil is, however, the greatest source of danger; and, wherever it is likely to occur, the use of piled foundations becomes indispensable. For all practical purposes, so long as even peat is prevented from spreading laterally, and is kept charged with moisture, it may be considered incompressible under the safety load of about 20 lbs. on the square inch, provided that the load be applied regularly, evenly, and gradually. These conditions can rarely be attained, and it thence happens that foundations upon peat involve more care and anxiety than any other, and should not be attempted unless under very cogent reasons of economy. The Oxford and the lias clays are particularly exposed to the danger alluded to above, from the running sands they contain, and the distances to which these latter may affect the surface soil are very great. The Oxford clay, for instance, has been known to slip when the ground had an inclination of 1 in 10; the architect who is about to erect a building upon so treacherous a foundation would therefore do well to assure himself against any accident of this description. So long, however, as clay is prevented from spreading laterally there can be no reason for not loading it with any weight which concrete would support: the same remark may be extended with greater confidence to soft chalk, limestone, or sandstone soils, and even to sand itself: but when clay from being too near the surface is caused by the atmosphere to contract or expand, another evil arises. **FOUNDATION. G. R. B.**

**COMPTE or CONDE (PEDRO or PERE)** of Valencia in Spain, is wrongly supposed to have built the *sala capitular*, erected

1358, to the cathedral in that city: he completed 1482 the arches and vaulting of Valdomar's enlargement of the cathedral; and as *maestro-mayor* of the edifice also executed, 1486, its marble pavement. The *casa lonja* in the plaza del Mercado, also at Valencia, and the finest edifice of its class in Spain, was commenced 1482 and finished 1492 by him. He was engaged with his fellow *maestro-mayor* to the municipality, Pedro Vinya or Viña, on hydraulic works and surveys of public buildings in 1498 and 1500; and he was one of the architects assembled 1505 to condemn the condition of the octagonal lantern of the cathedral at Zaragoza.

66.

**COMPULSORY SALE.** A term used to express one of the grounds upon which a claim is made for a sum beyond the settled value of property actually taken, and damage to that remaining, to compensate the owner of such property for a sale under the compulsion of an Act of Parliament. The principal grounds are the time, trouble, and cost in seeking a new investment and realizing the same, and the loss of interest till such new purchase can be made, for disturbance, the privation of an old house, and the general anxiety and distress of mind caused by the removal. This varies from 10 to 15 per cent. on the value, according to circumstances.

A. A.

**CONCEPCIÓN (SANTÍSSIMA).** The capital of the province of the same name in Chili. The cathedral, with the greater part of the city, was destroyed 1835 by an earthquake, which appears to have spared to some extent the college of the Jesuits and some small churches, although it laid in ruins the houses that were built of sun-dried bricks, or with clay walls, and had tiled roofs. A new hospital was nearly finished, and a *seminario* in process of construction 1856.

96.

**CONCHA.** The Latin general term for a shell. It was applied by monastic writers in their descriptions of churches, not only to the half dome which formed the covering of a semi-circular apse but to the apse itself, to the domed covering of the ciborium, and to the font. MACRI, *Hieroglyphicon*, 4to., Venice, 1735, s.v., shows that its diminutive, *CONCHULA*, was applied to a recess, also called *EXEDRA* and *SECRETARIUM* (containing in later times a sort of credence table or table of prothesis), on each side of an apse, and near the altar. The word *concha* is proposed by WHEWELL, *Architectural Notes*, 8vo., Cambridge, 1830, p. 43, to express that portion of a sphere which forms the entire face of a pendentive. The application of the imitation of a shell to the head of a niche is familiar to every student of modern architecture, and is to be seen in the ruins of Baalbec and Palmyra, and in MAZOIS, *Pompeii*, i, pl. 34.

**CONCORD (TEMPLE TO).** This name has been given to two buildings in the Forum at Rome; one directly south of, and facing the Mamertine prison, has eight columns remaining of a hexastyle peripteral portico of an Ionic order: this has since been called the temple of Fortune, but of Saturn by BURGESS, in a paper read at the Royal Institute of Architects, 28 June 1852. The temple of Concord was a celebrated building erected by Camillus after the defeat of the Gauls, in consequence of the concord between the senate and the plebs (PLUTARCH, *Camill.*, 42). There has been much controversy as to the site of this temple; but from the various facts that it was between the Capitol and Forum (FESTUS, v. *Senaculum*); at the foot of the Gemonian steps (DION. CASSIUS, lviij, 11); that its front looked to the back of the colossal statue of Domitian (STATIUS, *Sylv.*, i, etc.); from the EINSIEDLEN MS.; from inscriptions found at various times, and cited by CANINA, *Roma Antica*, sec. Fora, who gives a plan and elevation, restored from the remains and from medals; and from the excavations in 1830, it is now agreed on all hands that it stood under the tabularium, where the footway ascends to the Capitol, close to the Mamertine prison. Great confusion has arisen on this subject from the fact that there were no less than four temples to Concord in and about the Forum; one built in 387 by Camillus, as has been said; one a small temple or *edicula* on the area of Vulcan by C. Flavius near the Grecothesis (PLINY, *H. N.*,

ARCH. PEB. SOC.

xxxiii, 1) in the year 449; one on the Arx, in consequence of the vow of Manlius, and near the temple of Jupiter Moneta, in the year 536; and one by Lucius Opimius after the slaughter of the Gracchi (APPIAN, i, 26; PLUT., *Gracch.*, 17; VARRO, v, 155), erected in 722.

A. A.

**CONCORDIA.** A city containing some handsome houses in the government of Venice in Austrian Italy. Besides the cathedral dedicated to S. Stephen, the see possesses another, designed by Antonio Marchi, and dedicated to the Virgin and S. Andrew, 4 August, 1833, at Porto Gruaro, where the usual episcopal residence and the *seminario* are the other principal buildings.

96.

**CONCRATITIUS PARIES.** A term used by ULPIAN, *Dig.*, 17, ii, §2, *concratitius*, PAPINIAN, *Pandect.*, 17, which appears to be the same as the *cratitius paries* of VITRUVIUS, ii, 8, vii, 3, viz. a wall made of upright stakes with *cannæ* or withs twisted between, after the manner of a *crates* or hurdle, and then plastered; in fact the English "WATTLE AND DAB". They differed from *formaceæ parietes*, which were walls where the clay was forced in between two waling boards or *formæ* (PLINY, xxxv, 14), or COB-WALLS, PHILANDER, *Comm. in loco*.

A. A.

**CONCRETE** (the *signinum opus* of VITRUVIUS; Fr. *béton*). The name given since 1820-30 to a composition formed of gravel, pebbles, broken stone, fragments of brick or tile, slag, or other hard mineral substance, mixed with cement, or with lime and sand. GODWIN, *Prize Essay upon the nature and properties of concrete and its application up to the present period*, published in the *Transactions* of the Institute of British Architects, 4to., London, 1836, states that concrete appears to have been employed throughout the Roman empire, as well as in Asia and even in America; by the mediæval builders; and to have been described by ALBERTI, iii, 5. The employment of a kind of concrete is mentioned by SAUVAL, *Histoire*, fol., Paris, 1724, i, 228, describing the completion, 1507, of the pont Notre Dame at Paris, under Fra Giocondo; by DELORME, 1568, ii, 2; by SAVOT, *Architecture Française*, 12mo., Paris, 1624; and by BLONDEL in his notes to that work, 1685, p. 115, in speaking of the use of pozzolano at Naples. It appears, however, to have been generally neglected in Europe for two or three hundred years, until it was recommended by BELIDOR, *Arch. Hydraul.*, Series 2, Paris, 1753, ii, 185, who has furnished matter for comment to VICAT, *Recherches expérimentales*, 8vo., Paris, 1818, and to TREUSSART, *Mémoire sur les mortiers*, 4to., Paris, 1829. These later works have been criticized at considerable length by PASLEY, *Observations on Limes, etc.*, 8vo., London, 1838, in many detached passages. Little additional information of importance upon the subject has been since published beyond those in the *BUILDER Journal*, v, 442, and in the *CIVIL ENGINEER Journal* for 1843, vi, 46, etc., which correctly observes that the French *béton* is nearly identical with the English concrete, the differences being that *béton* is now always composed of a hydraulic lime or cement, and that the other material is added to it *after* the water necessary to make a paste; whereas the English concrete, as at present understood in specifications, is made with a lime or cement, to which the other material is often added *before* any water is used. Sir Robert Smirke, R.A., is generally considered to be the first person in England who practically called attention to the value of concrete for foundations.

The proportions of the ingredients in concrete vary according to the quantity of lime required; thus one part of lime is allowed to six or eight of the other materials, and these should consist of large and small particles mixed in such proportions that every interstice is adequately filled: this is usually considered to be attained by two parts of the larger, not bigger than a hen's egg, to one part of the smaller substances employed. As the lime absorbs the water, and with the sand occupies the interstices of the other material, it has been stated that, if the proportion of the lime be about one-eighth of the ballast, then  $3\frac{1}{2}$  cubic feet of *ground* lime and 30 cubic feet of ballast,

K K



with a sufficient quantity of water to effect the admixture (and this is generally rather less than a gallon of water to a cubic foot of ballast, or than equal measures of water and lime), will be required to make 27 cubic feet of concrete, *i.e.* there is a loss of bulk equal to all the lime and of about 10 per cent. of the ballast. But experiments detailed by Mr. T. H. Lewis, at the Institute of British Architects 1857-8, show that the same measure which gave one cubic yard of ballast, held precisely the same ballast *with the addition* of one-sixth in bulk of ground stone lime made with it into concrete, with the addition of about fourteen pails of water, and this cubic yard of concrete weighed 27 cwt. Hence in estimating, allowance must be made for this loss of material. Only such a quantity should be made at once as can be deposited on the moment in its place.

If a barrowful of concrete be thrown into water, the superfluous lime will rise and form a sort of putty on the surface of the water. The sand and gravel must be washed if found to contain alluvial or vegetable matter: salt water and sea-sand may be used, but form an undrying though very hard concrete. If it be impossible to remove flood water for a sufficient time during the construction, recourse must be had to the hydraulic limes, mortars (pozzolano, etc.), and cements. The prices of the materials, and any other incidentals according to circumstances being known, a calculation of the cost of concrete might be easily made if the amount of labour did not vary: in general a cubic yard of concrete made and thrown three feet is taken as an hour's work for two men. When it is considered desirable that concrete should set immediately, hot water is sometimes employed: and the concrete has been found exceedingly hard. It must be evident that the efficient strength of concrete is simply that of the mortar as it passes from setting to induration. The constants for formulas regarding the crushing weight, the flexure, and cross strain of concrete have not yet been satisfactorily ascertained. *BÉTON. FOUNDATION. LIME. PISÉ.*

PASLEY, pp. 87-9 infers that chalk lime should never be used for concrete in a damp situation; that good concrete cannot be made with any of the hydraulic limes mixed with gravel alone, but that a proportion of sand must necessarily be added; that coarse sand entirely unmixed with fine is not to be recommended either as an ingredient of concrete, or for making mortar; and that water cements should never be used for concrete, but that if so employed then no fine sand should be allowed to form part of the mixture.

Besides the usual and probably the best way, of mixing the ballast and lime in a dry state, afterwards throwing water upon the mass, and turning it by spade or pug-mill, there have been many other methods of mixing the materials for concrete; such as the old French method described by BLONDEL, *Cours*, 8vo., Paris, 1771, v. 425, of covering the lime with ballast, and throwing water over all; and the modern French method, dating at least from the time of BELIDOR, of adding the material to the mortar or cement. Other methods have been to wet the ballast, turning the lime into it; or to lay the ballast in place, grouting it with lime, as originally practised by Sir Robert Smirke at the Penitentiary in 1817; or ram the stones or other material in place, grouting each layer with mortar, as practised by Sir John Soane at the State Paper Office, the Board of Trade, etc.; or lay the ballast and lime in place in alternate layers, throwing water upon them; or lay the stones and mortar in place in alternate layers, which does not consume a sufficient quantity of stone; or throw the ballast and lime mixed into water, then turning it; this last method should only be adopted when there is standing water or bog that is not to be pumped out. In 1770, Dance, having to sink the principal foundations of Newgate prison to a depth of 40 ft., in consequence of their site being partly on the ancient ditch of London Wall, threw into the bog cartloads of whole and broken bricks and cartloads of mortar, in the proportion of one to four; and this rough concrete made an excellent foundation.

Some practitioners recommend that the modern French me-

thod of making *béton* should be retained; some specify that the lime or cement is to be used in a ground state and fresh from the kiln; others are satisfied with the fracture of the lumps of lime or cement by the workmen when in the act of mixing it with the other material: some consider it useful to throw the concrete from a height, three, four, or five yards, into its place; others are content to let it be shot out of the barrow as it may happen: some order that the concrete so thrown should be trodden or punned (rammed); whilst others recommend that it should be left undisturbed. Less than 3 ft. in depth cannot be depended upon in a bad foundation, and it should never be less than 12 ins. wider than the footings of the superincumbent wall. In some other cases the whole area of the site is also covered with a less depth of concrete, in which case provision for drainage, etc., should be made beforehand.

The depth of each layer of concrete is generally from 6 or 7 to 12 or 15 ins., and one should be finished before another is begun; but if this be impracticable, each successive one should form a step with the one beneath and the next above. Concrete, when made of unground lime, often continues to slake after it is thrown into its place, and expands, thus forcing itself together, and gaining  $\frac{3}{4}$  inch in every foot of height; the size thus gained is never lost, so that if it be placed in the desired situation before *heating* as it is termed, in consequence of this 'puffing', as it is called, it becomes a very useful agent in underpinning a wall. From the same circumstance of its expansion in setting, care must be taken when using it for floors and for the spandril of arches, to allow sufficient space, and to lay it in such a way that this increase may take place without thrusting out the walls, as has occasionally happened.

Concrete in small blocks, known as Ranger's patent artificial stone, has been used to a limited extent in the construction of domestic buildings: it was employed for the additions to the College of Surgeons, Lincoln's-inn Fields, 1835-6, and for a guardhouse in St. James's Park, London; Sir E. Codrington's house; and a row of houses on the Western Road at Brighton (this row was built about 1836, partly in small blocks, partly concrete *pisé* formed in its place in moulds); and a proprietary grammar school (G. L. Taylor, architect) in the parish of Lee, very near Blackheath, were amongst the works executed under the patent. In opposition to the opinions of PASLEY, p. 145, and of many civil and military engineers, the use of concrete has extended, from foundations of buildings, backings of wharf walls and retaining walls, to the employment of it for the backing of vaults to produce a level surface; for the substance of fire-proof floors; for the base of floors, pavements, and roads; for backing to the abutments of arches; and in the shape of *pisé* work for the walls, floors, etc., of houses, bridges, and moles, by French, if not in some cases by English engineers.

Amongst the most remarkable applications of concrete to engineering purposes, executed of late years, may be cited the backing of the quay walls of the Southampton and of the Havre docks; the jetties of la Joliette at Marseilles and of the harbour at Algiers; the new graving dock at Toulon; and the unsuccessful attempts at Woolwich. At Dover the hearing of the new piers is executed of blocks of Portland cement concrete, laid by the diving bell; at Alderney the hearing of the piers is formed of blocks of rubble masonry set in cement, which are in fact little better than blocks of concrete; and at Cherbourg the foreshore of the *Digue* is protected by large blocks of the same character as those of Alderney, which are built up on the inward or land side of the *Digue*, and floated into their positions by means of pontoons. At Marseilles and at Algiers the jetties before named are executed in blocks of concrete of large dimensions cast down *à pierre perdue*, or at random, which were prepared on the shore and exposed to the action of the atmosphere for about six months before being immersed. At Toulon the concrete was, however, poured in under water, and it was allowed to set before any attempt was made to remove the

water from the interior. Some of the service reservoirs in the interior of Paris, and the beds of the canaux S. Martin and S. Denis, are also executed in concrete or *béton*, whenever they traverse the populous parts of the town at such a level as to expose the cellars of private houses to any danger of infiltration. The French engineers have almost unanimously agreed to substitute concrete for the puddle lining of canals, or for covering the extrados of arches in common road bridges; but they are particular in requiring that the whole of the chemical action of the water upon the lime should be completed before the concrete is put in place.

G. R. B.

SEMPLE, *Building in Water*, 4to., Dublin, 1776, pp. 75, 88; SMEATON, *Narrative*, fol., London, 1793, p. 118; HASKOLL, *Railway, etc., Guide*, 8vo., London, 1846-8, pt. 1, p. 116; VICAT, *Resumé*, 4to., Paris, 1828; *Papers, etc., of Royal Engineers*, 8vo., London, 1846; DONALDSON, in *Encyclopædia Metropolitana*, s. v. Stucco; RENNIE, *Employment of Rubble Béton, or Concrete*, etc., read at Inst. of Civil Engineers, and given in *CIVIL ENGINEER Journal*, 1857; the *Annales des ponts et chaussées*, etc.; BURNELL, *Limes, Cements*, etc., 12mo., 1850.

CONDE, see COMPTE (PEDRO).

CONDENSATION. The separation of the aqueous particles from the atmosphere through contact with a surface or current of lower temperature. This effect is most generally perceptible in buildings, upon walls, metal work, slate, glass, and other non-absorbent materials. The condensation upon such surfaces is produced in consequence of the difference in temperature existing between them and the surrounding atmosphere, and depends also upon the natural laws of the tension of vapour and the dew-point; for the quantity and tension of vapour in suspension is principally regulated by the temperature of the air, and the dew-point is, in fact, the temperature at which vapour is deposited upon an object colder than itself. The temperature of the air is, moreover, greatly affected by the conducting powers of the bodies with which it is in contact, and is lowered most rapidly by contact with those substances which easily radiate, or transmit heat; so that the condensation takes place with the greatest rapidity upon "good conductors," as the bodies which thus transmit heat are called. Generally speaking, the closeness and density of bodies may be taken as indications of their conducting powers; and, practically, it is found that condensation takes place, *cæteris paribus*, most perceptibly upon the hardest building materials of the same kinds; although no doubt their thickness, or other conditions of form, will often greatly modify any such general rule. CONDUCTOR OF HEAT.

Condensation takes place *externally* when the atmosphere is highly charged with vapour, and a sudden change of temperature diminishes its power to retain it in suspension; but as the internal temperature is almost always higher than that of the exterior, it does not necessarily follow that condensation should take place in the *interior* upon the occurrence of a sudden depression in the temperature of the external air. If, however, the internal atmosphere should be highly charged with vapour, and at the same time the external temperature be lowered to such an extent as to abstract the heat from the walls or windows of a building, condensation will take place rapidly in the interior, and upon the various materials of which it is composed, in proportion to their power of transmitting heat. Condensation takes place both externally and internally, when warm air highly charged with vapour comes in contact with solid bodies previously cooled; as in the case of a thaw, accompanied by a south-west wind (in England or in western Europe) succeeding a long frost.

Great care should be observed in the use of such materials, particularly for ceilings, as from their nature are liable to produce condensation, as great annoyance and injury arise when this takes place. Special provision should be made in the case of skylights and similar roof coverings, for collecting and carrying off the moisture produced from this cause, by forming a small gutter in a convenient position. Most windows of the mediæval

period have small channels cut in the cills to allow the condensed water to escape. Especial care should be taken to avoid any lapping of the glass, or any interference with the flow of the water of condensation; for if a putty-joint should be introduced in such skylights, or any crossbar be formed, the water of condensation will be collected and fall upon the line of the joint or bar; and if no putty be used in the joint of the glass, a portion of the water will be retained by capillary action between the laps, and will, in all probability, break them in case of frost. In passages, corridors, staircases, or other parts of buildings in which it is difficult to maintain a uniform temperature, it is desirable, in cold latitudes at least, to cover the walls with materials known to possess a considerable power of absorption, in order that the condensed vapour may not be disagreeably apparent; and, for the additional reason, that the building materials which are absorbent are amongst the worst conductors of heat, and as such, least likely to cause condensation by the abstraction of warmth from the atmosphere. It is essential to make some provision for the escape of the water of condensation which is formed upon the large sheets of glass in modern shop windows, because the heat given off by the combustion of gas during long winter evenings, enables the internal atmosphere to take up more moisture than it would do under normal circumstances, and this moisture will, very probably, be thrown down by the lowering of the temperature at night. A difference has been observed in the amount of condensation which takes place upon glass, according to its colour. It is least upon red glass; and upon the other colours it appears to take place in proportion to their influence upon the conduction of heat. THOMSON'S *Introduction to Meteorology*, chap. vi, vii, contains references to nearly all the authors who have treated upon this subject.

G. R. B.

A great objection to the use of slab slate without a counter-ceiling is, that damp air, as it comes in contact with the underside of the slate in certain states of the weather, especially after a frost, condenses and falls. This may frequently be prevented by covering the underside of the slate with one or two coats of strong distemper colour.

Condensation on windows is generally caused by a deficiency in the means of thorough ventilation. Where it arises from the use of gaslights, care should be taken to take off the products of combustion: where this cannot be managed efficiently, a deliquescent substance may be employed with advantage, as newly burnt unslacked lime, or chloride of calcium; another preparation recommended is three pounds of potash well mixed with one pound of common salt, spread out well, or dissolved in a very small quantity of boiling water, and then soaked up in a dry cloth and spread near the glass; *BUILDER Journal*, iii, 99; iv, 185, 203; x, 79.

CONDITIVUM or CONDITORIUM. These Latin words meaning a hiding place, and answering to the Greek term 'hypogeum', were used by the Romans for a sepulchre under ground, in which one or more dead bodies were placed entire; such as the chapel of S. Hermes at Rome, given in D'AGINCOURT, *Histoire*, fol., Paris, 1823, (Architecture), pl. 12-13. 78.

CONDOM. A city in the department of Gers in France. The town is now chiefly remarkable for its two bridges, and its central place, containing a noble parish church that appears to have been called a cathedral before the foundation, 1317, of the episcopal see, which was suppressed 1801. 96.

CONDUCTOR OF ELECTRICITY, see LIGHTNING CONDUCTOR.

CONDUCTOR OF HEAT. A body is said to be a good or a bad conductor of heat in proportion to its powers of transmitting it. The bodies which become hot with the greatest rapidity when exposed to flame, are said to be the best conductors.

The density of bodies appears to have considerable influence upon the conducting power when bodies of the same description are compared, but this law by no means holds good with the metals, stones, or woods, compared with one another.



Thus it has been ascertained that the conducting power of lead or of silver is increased by the mere fact of the increase of their density; but the densest of metals, platinum, is one of the worst conductors of heat; and from the experiments of Meyer of Erlangen, it would appear, that the woods which have the least specific gravity are precisely those which have the greatest conducting powers. The state, and even the colour, of the surfaces exposed to the source of heat, have great influence upon the conducting power; for metals, marbles, and glazed earthenware receive and part with heat with more difficulty when polished, than they do when dull; and it is found that dark bodies receive and part with heat more rapidly than light coloured ones. It does not appear, however, that there is any invariable law affecting these conditions; which, indeed, depend principally upon the specific heats of the bodies observed, which can only be known by direct observation.

From the researches of LESLIE and RUMFORD it may be stated, that the materials more generally used may be classed as follows in reference to their conducting powers:—

1. Gold.	5. Iron.	9. Marble.
2. Platinum.	6. Zinc.	10. Porcelain.
3. Silver.	7. Tin.	11. Terra cotta.
4. Copper.	8. Lead.	12. Wood.

Through the quantity of air retained between the filaments of woollen stuffs, furs, down, etc., those bodies are unfavourable to the distribution of heat. Glass has a very low conducting power, which is said to be even less than that of wood; but it may be important here to observe, that the facility with which it admits of the passage of caloric rays—its diathermal property—is of more importance to the architect than even its conducting power. According to PECLET ordinary window-glass allows 0·7 of the heat emitted by flame to pass through its substance; whilst it allows only 0·45 of the heat emitted by incandescent metals, or 0·07 of that emitted by metals at a dull heat, to pass. This diathermal power diminishes in proportion to the thickness of the glass, but not in the same ratio.

The conducting power of bodies ought to be borne in mind as fixing their application to building purposes. Thus, fire-places, ovens, and other sources of heat, should be surrounded by bad conductors; whilst vessels in which steam is generated, or air heated, should, on the contrary, be good conductors. The thickest glass should be used for windows; and when it is important to retain warmth, double sashes should be introduced. LESLIE, *Treatises on various subjects*, etc., Edinburgh, 1838; HAÛY, *Traité Élémentaire de Physique*, Paris, 1821; PECLET, *Traité de la Chaleur*, etc., Paris, 1854; LESLIE, *Heat*, 1804; THOMSON, *Heat and Electricity*, 1840; HUTCHINSON, *New Experiments on Building Materials* (pamphlet), 1843; BRITISH ASSOCIATION (Report), 1841. G. R. B.

CONDUIT. This word, conformably with the original Latin term *conductus*, has two meanings; viz. one as a long narrow passage between two walls, or under ground, for secret communication between two apartments; and the other as a constructed passage for water; the French *conduit* answers to both these cases: but the French *conduite* answers to a canal made of pipes, being a sort of subterranean or concealed aqueduct, which is also called in English a conduit. Science and economy in the transmission of water form part of the subjects treated in the *Detached Essay, Aqueduct*. 1. 19. 25.

CONDUIT, properly CONDUIT HEAD. The name of a building, generally treated ornamentally and placed above ground, that serves as a cistern from which water is publicly drawn for private use. This sort of structure corresponds with the Latin *castellum aquæ*, VITRUVIUS, viii, 7; ix, 9; and with the Fr. *château d'eau*; LELAND, *Itinerary*, 8vo., London, 1745, i, 34, says, "a castle of conduct-hedde." The chief examples in England are those at Lincoln, Northampton, Durham (where it is called a *pant*), and Chelmsford. Several examples, of French design, are given in DUVAL, *Fontaines*, etc. fol., Paris, 1812, and in a later edition. The remains of the ancient cas-

tello dell' acqua Giulia, on the Esquiline hill, and the modern fontana Paolina on the Janiculan hill at Rome, are ranked by QUATREMÈRE, *Dict.*, s. v. Châtean, far higher than the celebrated Fontana di Trevi at Rome and the *château d'eau* formerly opposite the Palais Royal at Paris. The *sebel* of the Mahometan architects forms a subject in almost every work that illustrates the architecture of Turkey or Egypt. NYMPHEUM.

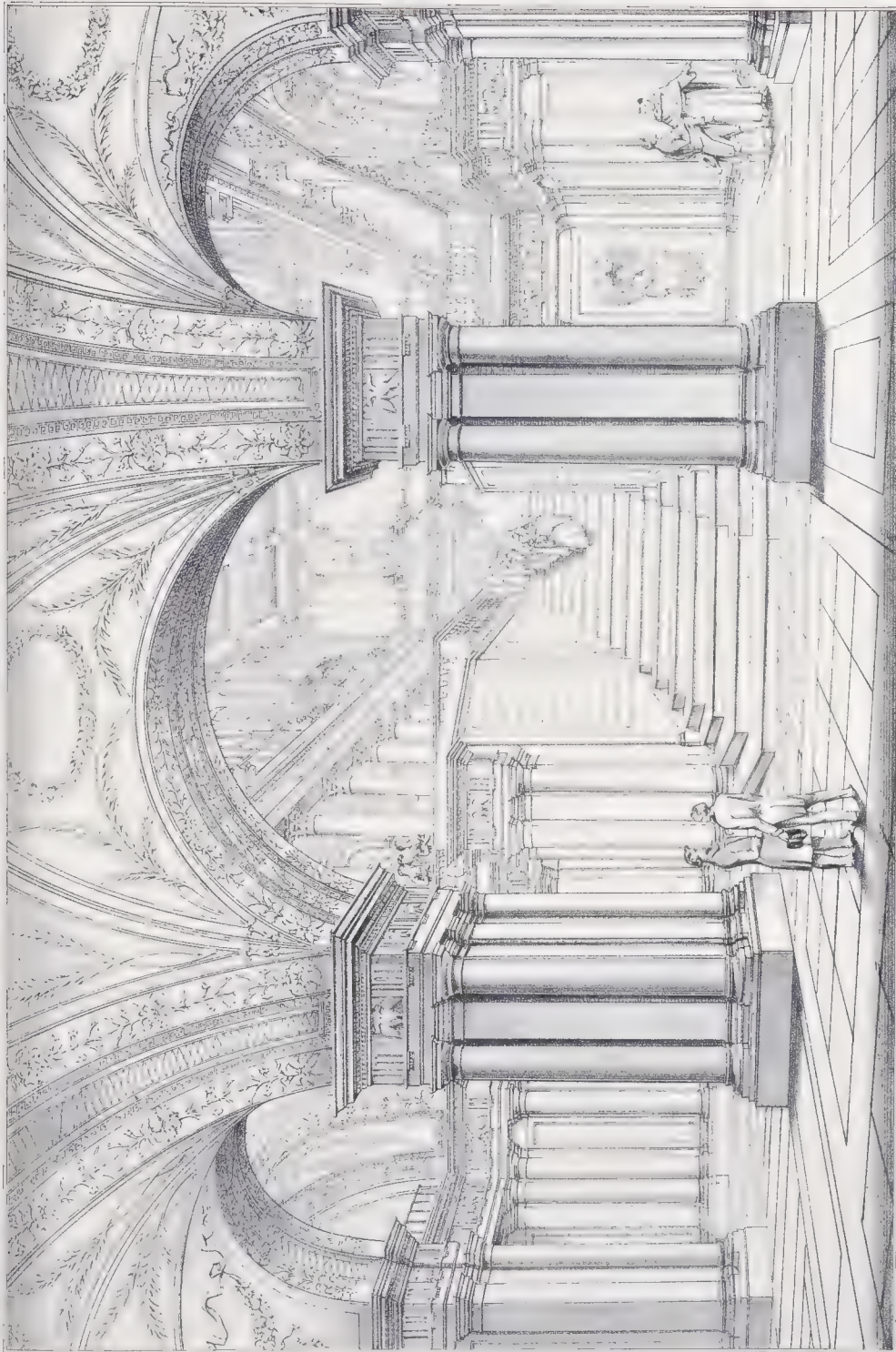
CONDUPLICABLES FORES, see QUADRIFORES.

CONFESSION (or CONFESSIO, WEBB, *Sketches*, 8vo., London, 1848, pp. 348-548; WILLIS, *Canterbury*, 4to., London, 1845, p. 11. It. *confessione*; Fr. *confession*). The place where the body of a saint, generally of a martyr, is kept and revered in a Roman Catholic church. The term appears to have been also applied to a shrine in which relics of any kind were kept. The position of the structural confession has varied. VIOLETT LE DUC, *Dict.* s. v. Autel, has shown the reliquary placed above, and also level with, the altar, in which cases it was behind the altar; whereas in Italy the usual position is immediately below the high altar, and generally in a crypt, which is regarded as a chapel. Access from the church to this crypt is obtained by steps under, or on each side of, the altar, and from this descent the Italians frequently call the confession, or crypt, *discesa*; sometimes the floor of the choir is raised to give height for the crypt. Amongst the most celebrated at Rome are those of S. Martino ai Monti (*Illustration*), S. Paolo fuori delle mura, Sta. Maria in Cosmedin, and I quattro SS. Coronati: other examples are given in SEROUX D'AGINCOURT, *Hist.*, fol., Paris, 1823 (Architecture), pl. 13-14, 16, 25, 28, 41, 73. The word sometimes means a church (basilica) or oratory, according to the authorities quoted by DUCANGE, *Gloss.* s. v. Confessio. CRYPT.

CONFESSIOAL (It. *confessione*, *confessionale*, *confessionario*; Fr. *confessional*). The closet in which a Roman Catholic priest called the father confessor receives the confession of his penitent. It is generally formed of wood (in Italy of walnut, in France and Germany of oak), in three divisions: in the central one, the back supports a seat for the priest, each side has a grated aperture with a shutter, and the front has a hatch door, with shutters to the upper part of the doorway, which are closed during confession; sometimes curtains are substituted for these large shutters. The external divisions have each a kneeling-board below the grated aperture, and are not closed by doors. Such are the confessionals generally seen; one of the splendidly decorated examples in S. Gudule at Brussels, is given in the *BUILDER Journal*, iv. 486, and others in HAGHE, *Sketches*, fol., London, 1840, pl. 12; and a curious example by ALOË, *Pictures by Giotto in the church of Sta. Maria Incoronata*, at Naples, 4to., London, 1843; but the form of some special confessionals, as those of the Grand Penitentiary in the Lateran, Vatican, and Liberian basilicas at Rome differ in some respects. It is said that formerly the penitent occupied a seat by the side of the priest; and the CAMBRIDGE CAMDEN SOCIETY, *Handbook*, 12mo., London, 1847, pp. 198-206, gives a list of cases in which remains of confessionals may perhaps be traced. 25. 96.

CONFANS STONE. A member of the tertiary limestone series, raised extensively at Confans S. Honorine, at the confluence of the Oise and Seine, near Paris, from the beds of the *calcaire marin* of Cuvier's classification. The Confans stone is of a very pleasant cream-colour; it is sawn by the handsaw; is harder, and resists atmospheric action more satisfactorily than the vergete de S. Leu, but is never used in damp situations in buildings of importance. The density of the best beds is stated by CLAUDEL to be 2·07, and its resistance to a crushing weight to be equal to 1,277 lbs. on the superficial inch. This stone might easily be brought into the English market, and, from its durability, would be likely to supersede the Caen oolite. G. R. B.

CONFORTO (GIAMBATTISTA) designed, 1604, the handsome Dominican church of S. Severo at Naples. 95.







CONFORTO (GIOVANNI GIACOMO DE), also of Naples, designed, about the same period, in that city, the church of Sta. Maria della Verità, generally called S. Agostino de' Scalzi, for the Barefooted Augustinians; and the neighbouring church della Madre di Dio, also called Sta. Teresa de' Scalzi in the Strada di Campodimonte, for the Barefooted (Theresians) Carmelites; the majestic fourth cloister, of two stories in height, begun 1613, at the Benedictine monastery of Monte Oliveto, which was finished, 1679, by Muzio Naclerio; and the gate, 1623, of the cappella del tesoro di S. Gennaro, in the cathedral; this gate was not finished until 1668, but he died 1631. 95.

CONFRATERNITY, see GUILD.

CONGEE. A term adopted in the English language from the French *congé* for that portion of a circular outline by which the shaft of a pillar or pilaster meets the fillet at its extremities, thus answering to the ΑΡΟΦΥΓΗ, or apophysis and apothesis: the same name is given to a similar means of connecting the upright face of any work, such as a wall, a dado, or a corona, with a fillet. The word *congé* is used in the French language for a CHAMFER, and for a CHAMFER STOP.

CONGELATION or FREEZING. The condition of water or other fluids in passing from the liquid to the solid form, in consequence of a decrease of temperature. All substances in this passage experience a great diminution of volume, with the singular exceptions of water and bismuth, which actually expand in congelation; every lowering of the temperature of solid bodies is likewise accompanied by a certain proportionate decrease of volume, dependent upon the nature of the body itself. The laws of this change of volume will be best discussed under EXPANSION; herein will only be noticed the effects produced by the ordinary freezing of enclosed moisture, or the lowering of the temperature beyond 32° of Fahrenheit's scale, upon building materials. These are, firstly as regards metals, an increase of brittleness, particularly in the case of cast and wrought iron; so that girders, columns, etc., are less able to resist efforts of concussion in cold than they are in ordinary weather. Secondly, as regards the more permeable materials, such as wood, slates, stones, bricks, etc., congelation may be very destructive, if the pores of those materials should not allow the water they may contain to expand freely. It is on this account that the lamellar structure of some stones is so objectionable, and that that class of materials is most exposed to destruction when placed with "the bed to the weather"; because the water taken up by capillary action, in its change under the effects of frost, disintegrates the mass, and the capillary action of course takes effect to a greater extent in this direction of the stratification, whilst the adhesion of different layers to one another is also less than that of the molecules of each particular layer to one another. BED. But it would appear that the ultimate form of the molecules of a crystalline body has a great influence upon its resistance to this action; for some of the Yorkshire stone does not always flake off, when laid flat especially, although the water between its beds may actually have frozen; some slates, such as the Bangor or the Angers slates, do not yield to the same extent as do the ordinary Devonshire or Cumberland slates. Under ATMOSPHERIC INFLUENCE AND BRARD'S DISINTEGRATING PROCESS, some remarks will be found upon the value of a process for the purpose of ascertaining *a priori* the effects of frost upon building stones.

G. R. B.

CONGLOMERATE. A name applied by mineralogists to rocks formed of the fragments of previously existing deposits, which are of variable volume, and united by a cementitious material. The millstone grits, of which the Bramley Fall stone is a good representative, and the Hertfordshire pudding stone, are conglomerates of silicious materials united by a silicious cement. Some of the breccias, such as the Brocatello, the brèche d'Alet, de Tolonet, of Gibraltar, are composed of fragments of calcareous rocks united by a calcareous cement; whilst the green Egyptian breccia, so much esteemed by the ancients, was composed of fragments of granite, porphyry, and petrosilex, in

a cement of petrosilex. Some feldspathic breccias or conglomerates have also been worked in Belgium. The conglomerates are generally hard and resisting. The millstone grits, in particular, are amongst the most valuable materials for foundation, or water, works. The breccias are mostly used as marbles, and indeed the term seems to be applied only to those conglomerates which are susceptible of being used in ornamental construction, and of receiving a polish. BRECCIA.

G. R. B.

CONI or CUNEO. A walled city in Piedmont, made the seat of a bishopric 1817. The two gates, and the wide high-street, which is lined with porticos; the cathedral, not interesting; two churches; seven monastic establishments, including that of the Capuchins with a church said to have been built in a Pointed style in the lifetime of S. Francesco d'Assisi, to whom it is dedicated; an hospital; an orphan asylum; a *ginnasio* or royal college; public baths; and the handsome town hall, are the chief public buildings, of which the last named is the most remarkable. 28. 96.

CONIGO (BELTRAMO DA) was elected one of the architects to the cathedral at Milan 12 April 1394, in which year his son CRISTOFORO was appointed his colleague. 27.

CONISTERIUM (Gr. κοιστήριον). The Latin name for an apartment in the *palaestra* or *gymnasium*, placed at the right hand of the *ephebeum*, but separated from it by the *coricum*, in the double portico that faced to the south: VITRUVIUS, v. 11. It was probably used either as a place for wrestling, or for keeping and using the sand, with which the wrestlers were sprinkled.

CONISTRA (Gr. κοιίστρα, a dusty spot). This term, said to have had a similar meaning to the preceding one, has received another architectural application, viz. for a portion of the ORCHESTRA in a Greek theatre.

CONJEVERAM. A town near Madras in the Carnatic province of Hindostan. The houses, built with clay walls and roofed with tiles, are square with a central court, and one story high: the streets are wide and straight, and bordered by rows of cocoa-nut palms enclosed by small clay walls painted vertically with red and white stripes. At the larger end of the town are two temples to Mahadeva or Iswara (*i. e.* Siva) and his wife Camachuma: on the left hand of their first court, and inside a lofty entrance gateway or gopura, is a mandapam or choultry, said to have a thousand pillars, for the visits twice in the year of the image of Vishnu; opposite to this is a tank and several small pagodas; about half a mile distant is another temple, now deserted, shewn in ANNESLEY (Lord Valentia), *Travels*, 4to., London, 1809, i. 436. About three miles distant, at the small end of the town, is another grand temple to Vishnu, which has a choultry for the annual visit of Siva. There are also many large tanks and small pagodas, with whole streets of choultries, and a small mosque. BUCHANAN, *Journey*, 4to., London, 1807, i. 12.

CON-MOO. A tree found in the province of Tavoy in the East Indies, which produces a good timber used for house and boat-building. 71.

CONSEQUENTIAL DAMAGE. The term applied to the claim made by owners of property for compensation for being "injuriously affected" in consequence of the acts of another party. The first of these is "severance": thus when a railway passes through land and leaves a portion detached from the rest, to which the owner has difficult access, as in case of farming-land, he may be obliged to carry his crops a mile round before he can find a proper crossing over the line; or in case of parks, gardens, etc., where the pieces left are of little value when separated, compared to what they were as a whole. The loss of light and air, disturbance by noise, loss of privacy, the claimant's property being liable to be overlooked, loss of springs of water, in short anything, that would render the remainder of the property of less value in consequence of the results of the acts or works of the company, may fairly be claimed in addition to the value of that actually taken. COMPENSATION. COMPULSORY SALE.

A. A.



CONSERANS, in France, see LISIER (SAINT).

CONSERVATORY. A building employed for the preservation of plants. Originally it was a movable timber-framed house with boarded sides and roof, as at Heidelberg (according to SOLOMON DE CAUS, *Hortus Palatinus*, fol., Frankfort, 1620, who advocated a permanent erection. The old orangery, as it is called, in Kensington Gardens, London, which has an opaque roof carried by brick walls and a glazed south front, is a good example of this second style of conservatory, and was originally called a greenhouse, like that in the Botanic Garden at Chelsea 1732, Edward Oakley architect. Like the other, it was meant to preserve from extreme wet and cold the large exotic plants as the aloe, orange, myrtle, pomegranate, sweet bay, etc., that during summer required the open air for growth, but when ceasing to grow on the approach of winter could be moved into the stone floor in their tubs, boxes, or pots. Sometimes for the sake of an agreeable appearance there was a double floor, so that the pots, etc., were sunk until the surface of their earth was nearly level with that of the apparent floor. This sort of conservatory, frequently an object possessing architectural merit, was sometimes also used as a ball-room, a BANQUETING-ROOM, a passage between the body and wing of a house, and an entrance-hall; it continued to be erected until the beginning of the present century in England, and is not disused on the continent, for as it was easily warmed to the low heat sometimes required, and as the contents did not exact much labour, it might be spacious without being expensive. This is the French *orangerie*, *serre froide*; and German *kaltes gewächs-haus*.

The invention about 1720 of a glazed roof, giving the perpendicular light required for the healthy growth of plants, introduced a great change: the trees, etc., were then planted in well-drained beds five or six feet in depth in the conservatory; even when the disposition to make wood rendered it necessary to confine the roots of some species, their pots were plunged into their beds. This, the Fr. *jardin d'hiver*, glazed on all sides, warmed to a moderate degree of heat in the winter, and sometimes partly occupied by plants in pots on stages, is the conservatory still seen at many large villas. If the plants are tolerably acclimated, the glazed sides (except the long north one) and roof should be cheaply, that is to say safely and easily, removable. As soon as a moist high temperature was used to preserve tender plants, such as the palm, fern, etc., in a growing state throughout the winter, these free-soil conservatories, such as the palm-houses, etc., at the Botanic Gardens in the Regent's Park London, at Kew, at Chatsworth, etc., became examples of buildings that on a less magnificent scale would be more properly termed greenhouse, Fr. *serre tempérée*, Ger. *temperirtes gewächs-haus*; hothouse, Fr. *serre* or *serre-chaude*, Ger. *warmes gewächs-haus*, *treib-haus*, or stove, Fr. *serre chinoise*, according to the heat maintained therein. In imitation of them the name conservatory has not only been given to glass houses in which tender plants are grown in open borders, and in which such species as erica, fuchsia, and pelargonium, are kept, but to all ornamental glazed horticultural buildings.

A conservatory, of much less importance than the examples just cited, is often attached to a dwelling, for the display throughout the year of scarce and valuable plants whilst in perfection. They require to be placed on stages (generally following the rake of the roof) in order that their health may not be destroyed by removal from the glass to a greater distance than that which they held in the greenhouse, hothouse, or stove. Indeed, unless beds are introduced, the conservatory too often resembles, except in its scale and decoration, the glazed rearing sheds seen in nurseries and kitchen gardens; hence on the exterior a small conservatory generally does not look well, and always looks badly in the interior, if used for the growth of trees and shrubs, which must have room for themselves and broad walks between the stages and plants for the circulation of air. An attached (not connected?) conservatory at Burntwood Grange, near Wandsworth, is given in

the *Pictorial Handbook of London*, 8vo., London, 1854, p. (526). Whatever be the purpose of the conservatory, it ought to be a part of the flower garden belonging to the mansion; and if it be not connected with the dwelling, a couple of closets are a judicious addition to the other accessories, that will presently be mentioned. The attempt to unite the aviary with the warm and moist conservatory has failed where brass wire has been employed, as the metal fell in small pieces. A conservatory connected with the dwelling may be the means of producing the illness of the inhabitants and the deterioration of the decorations, furniture, etc., of the communicating rooms: the vitiation of the atmosphere by the vegetation, and the evaporation from the water daily given to the plants, are sufficient causes for these evils.

There has been great diversity of opinion, not only as to whether the site of a conservatory should be free or sheltered, but as to the aspect, when it has been an object to have as much sun-light and heat as possible upon the plants in the cold months: but if it be intended to maintain an artificial temperature of 50° throughout that season, the situation and aspect are of less importance than is generally supposed, but an aspect that admits as much as possible of the morning sun is absolutely necessary for the healthy growth of the plants. No conservatory for growth is now considered to be worth much in a garden, unless it is well supplied with the means of heat and ventilation. The first of these requisites demands the provision of piers between the beds for the carriage of the paths, and for the pipes or flues which should never show in a good conservatory; the usual appurtenances of the apparatus, as a furnace room, stoke hole, cellar, etc., are best placed at the back of a conservatory if it be moderately large; and if the back looks into the nursery garden, a back wall of brick gives an opportunity for such rooms or sheds as may require a little warmth; which might even consist of a greenhouse, hothouse, or stove, and be the main object of the warmth applied. Ventilation was better obtained in the days when many laps were required by the small sizes of glass that were used, than by louvres at the present time. The nature and slope of the roof is important (MANDAR, *Etudes*, fol., Paris, 1826, pl. 114, p. 24, gives the necessary calculations for the latitude of London); for general purposes a slope at 28° with the horizon is common (and the front, usually upright, might with some advantage slope at 70°), but curved roofs of small span are preferable, and if quadrants, might be very cheap in metal: a roof showing ridges and furrows to the long front, with their bearers or gitters rising one foot in every five feet of length from front to back, is at present a favourite system. LIGHT. It is usual to say that the expansion of metals is not sufficiently great in England to form an objection to their use in window bars and frames; those who have attended to wooden and metal conservatories, where a summer heat is not constantly maintained, affirm the difficulty at times of moving metal sashes, and the great amount of glass broken in such sashes.

The freezing of water in the lap joints of the glazing has been considered a great cause of breakage. The use of iron roof-sashes has been productive of injury to plants, by causing rusty droppings of condensed vapour. With respect to the colour of the glass, it has been ascertained that the natural effect of white light on vegetation is changed by that light being transmitted through coloured media; that red rays possess the most heating, yellow the most light-giving, and blue the strongest chemical effect; that under red glass, seeds will germinate, but the plant will be sickly, yet plants when flowering will thrive under it; that under yellow, seeds will not germinate, or if germination commences, the plant dies, yet if applied later the growth seems to be accelerated; that under blue, germination is remarkably accelerated, tending to cause the bulk of the plant to outgrow its strength; and that glass whitened by containing a little oxide of manganese corrects the colouring action of the iron usually existing in the sand em-

ployed in the manufacture, but gives a scorching power to the solar rays; but by substituting the oxide of copper, the advantage mentioned is retained, while the disadvantage ceases. An 'horticultural glass' is now largely used. Window-conservatories are occasionally formed outside the lower sash of windows composed of sashes which slide vertically, and usually exhibit signs of imperfect ventilation; that being, improperly, left to the communication with the apartment. THOMPSON, *Practical Treatise*, 8vo., London, 1838; BURN, *Conservatories*, 4to., London, 1854; and most of the works on horticulture. VINERY.

CONSESSUS. A place where persons sit together, printed *confessus* in several books of reference. A name given to the apse or other presbiterium in a church, on account of its being the place for the seats of the clergy.

CONSISTORY COURT. A spiritual or ecclesiastical court in which formerly the bishop presided, having some of his clergy for assessors and assistants; but in which the presiding officer is now sometimes the bishop's chancellor or commissary, and sometimes an archdeacon or his official. The *salle du petit consistoire* at Toulouse is given in NODIER and TAYLOR, *Voy. Pitt.* (Languedoc), fol., Paris, 1833, i, pl. 23, bis. According to KENNETT, *Parochial Antiquities*, 4to., Oxford, 1695, *Glossary*, s. v., this court was sometimes "held formerly in the nave of the cathedral church, or in some chapel, aisle, or portico belonging to it"; and this may serve as one illustration of the secular purposes mentioned in the article CATHEDRAL. BASILICA; GALILEE.

CONSOLE (It. *mensola*; Sp. *cartela*). A French word that has been adopted for more than a hundred years in the English language to signify an ornament in any material which projects about half its height or less, for the purpose of carrying anything. It is however called technically dentil in a cornice, or triglyph in a frieze. It has been said that the word console indicates that the corbel or the bracket has the peculiarity of profile at A; but this shape, although almost universally employed, is not indispensable to render a corbel a console; thus the French writers give to the examples A, B, and C, the title of *console avec enroulemens*; they also call that at C *console*



*coudée*; when the profile is straight, as at n, the face is frequently carved like the Doric triglyph. It will be seen that some profiles, as n, j, k, and m, give an idea of that conjunction of two corbels or brackets which is commonly called a TRUSS. A console may be used reversed, as at n and o; or with one side only seen, as it is sometimes applied on the face of a wall outside an architrave; and some French authors, by calling the *MUTULE console plate*, appear to hold the doctrine that a cantilever if plain should be called *corbeau*, but if decorated *console*; while others confuse *console* with *corbeau* and *modillon*. It is said that the English and French word is used for a triangular piece of board. BRACKET. CORBEL.

CONSTANCE. The capital of the circle of the same name in the duchy of Baden. Many of the streets and houses have not been materially altered since the fifteenth century. The *munster* (cathedral until 1802), commenced 1052, possesses sixteen monolithic pillars; the crypt, cloisters, chapel with sepulchre, sacristy, and the cupboards or presses in the vestry, are worth examination. Amongst other leading buildings are the Stephanskirche, said to date 831; the Dominican monastery, now a cotton printer's factory, which has a fine Early German Gothic chapter house, the church of a later period being in ruins, but the cloisters still perfect; the fine episcopal palace in a Pointed style; the town hall; the *kauf-haus* or merchants' dépôt, 1388; the theatre; and several educational establishments. *Du dôme de C. publié par une Société*, 8vo., Fribourg, 1825, with folio plates. 28.

ARCH. PTB. SOC.

CONSTANTINA (the ancient Cirta). The capital of the province of the same name in Algeria. The walls have four handsome gateways of Moresque work in which stones bearing Roman sculpture are employed; DELAMARE in the *Expedition Scient. de l'Algérie*, fol., Paris, 1850 (Archéologie), pl. 116-163, gives plans and views of various antiquities, the remains of the aqueduct to the river Rummel, and the bridge of two stories in height: a triumphal arch has been removed, it is said, to Paris. The streets are narrow and winding, and exhibit few features (beyond the usual plain front of Eastern dwellings, which here are three stories in height with sloping tiled roofs) because the mosques and other public buildings are of little importance, except the palace of the bey (the house of the French governor since the capture of the town 14 October 1837), of which two interior views are given in BERBRUGGER, *L'Algérie*, fol., Paris, 1843, iii, 39.

CONSTANTINE is described as "M. Constantine, an Italian, architect to our late prince Henry", by CAMPION, *Description of a Maske*, 4to., London, 1614, p. 4.

CONSTANTINOPLE, called in Turkish Islambul, and (from the Romaic *εἰς τὴν πόλιν*, pronounced *steembolin*), Istanbul, or Stamboul. The capital since 1452 of the Turkish empire. Byzantium, a town founded 656 or 658 B.C. occupied little more than the present site of the Seraglio: under the title of 'Nova Roma Constantinopolitana' it was enlarged 11 May 330 A.D. by Constantine, 413 by Theodosius II, and 620 by Heraclius. The city is now triangular in shape, having two sea-fronts altogether about eight miles in length, with twenty-one gates in very thick walls that are almost in ruins and have disappeared in many places; the inland or western side has seven gates in about four miles length of dilapidated walls: at the southern extremity is the edifice (renewed 1458) formerly a prison, called 'the seven towers', and containing the 'golden gate'; three of its towers disappeared before 1769; those remaining are 200 ft. high. The streets are extremely narrow, dark, dirty, ill paved, and so crooked that hardly any two are for any length parallel to each other. The houses are generally of three stories above the ground, there being no underground stories, and are mostly of wood with a foundation of rubble work. In the suburbs called Pera and Galata there are many houses built entirely of rubble work, and some few of squared stone with occasional courses of brick. The windows are glazed and closed with lattice work to a certain height, they have also jalousies which open towards the street. During the late war (1855-56) some few streets have been named, and in some instances the houses have been numbered. Arrangements are being made to light Pera with gas.

GYLLIUS in 1546 records "it is but a few years since that very magnificent temples were standing; now they are totally forgotten": but this lapse of memory is somewhat obviated by the Regionary given in SMITH, *Dict. Geog.* s. v., the perusal of which suggests that many remains might be discovered by judicious investigation, when that becomes possible, among the existing buildings. The following are the principal important remnants of antiquity:—at the northwest angle of the city (the so called) palace of Constantine, of Belisarius, or of Heraclius, or the hall of Hebdomon, *tekir serai*, which dates about the ninth century: near the *Bin-bir-direk* the extensive ruins called the palace of Belisarius: in the fowl market, *tauk-bazar*, near the mosque of Omar, the *tchernberli tasch*, *daikili tasch*, or Burnt column, also called the column of Theodosius, about 90 ft. high, said to have been brought from Rome by Constantine; the shaft, of red porphyry, is composed of eight blocks each 10 ft. high and 12 ft. in diameter, the joints being concealed by bronze or iron wreaths; it was restored by Manuel Comnenus: in the female-slave market, *avret-bazar*, a pedestal with part of the base of the white marble column of Arcadius; this has been called the 'historical column' on account of the sculptures, and contained a staircase (but is called the *kis-tasch* by WALSH, *Residence*, ii, 357, who gives an illustration of it);



D'ACINCOURT (Sculpture), pl. 11: in the Seraglio garden the column of Theodosius, about 60 ft. high, of a Corinthian order with a capital of verd-antique marble: near the gate of Adrianople the column erected to Tatian by Marcian about 450, and now called the *kis-tasch*, *keus-tasch*, or virgin's stone, from a tradition that it carried the tomb of a princess; the base and pedestal are of marble, and the shaft, about 80 ft. high, is of granite (?): and the *atmeidan* or place of horses, the site of the ancient Hippodrome, is now about 1000 ft. long by 450 ft. wide, but originally must have been much larger; its steps of white marble were used by Ibrahim Pacha (1520-66) for his palace adjoining; the pillars of the lower gallery were used in the mosque of Sulimanieh. The remains in the area are a stone column or obelisk about 90 ft. high, which is said to have been covered with bronze by Constantine Porphyrogenitus, but is now a rude work; "its builder, the head architect, Ghurbarin by name, lies buried at the foot of it": the twisted column formed by three intertwined serpents of bronze, and supposed to have belonged to the camp of Mardonius and to have been brought from Delphi, was thrown down and two heads taken away 1700; the third had previously been broken off (1566-74) by Selim II, and is said to be in the museum at the Seraglio; the base was excavated 1856 to a depth of 6½ ft. by Lord Napier, so that the present height is about 22 ft.: and the Egyptian obelisk of red granite about 60 ft. high, erected by Theodosius 390, according to inscriptions still legible on the lower plinth of the white marble pedestal; upon excavating in 1856 to a depth of about 15 ft., the pedestals of both obelisks were uncovered, showing inscriptions and a bas relief. The whole account of these ruins, given from ПОКОКЕ by QUATREMÈRE, *Dict. s. v.*, is so different from the above as to deserve comparison.

The city is principally supplied by public fountains with water conducted by several conduits and aqueducts from large reservoirs formed in the valleys at a considerable distance. The richer class have under their houses cisterns which contain the water from the roofs. The most ancient aqueduct, called *bostjohan kemeri*, built by Valens and Valentinian, is in three portions; the first, or 'the crooked aqueduct', has three tiers of arches one over the other; the second, or the long aqueduct, was probably rebuilt by Suleiman I. (1520-66), who repaired all of them; it consists of forty-seven pointed arches on the lower story and fifty on the upper; and the third, or the high aqueduct, appears to be later than the time of Justinian, to whom it is generally attributed, but has been ascribed to Andronicus Comnenus, 1183-5; it consists of four large arches above 50 ft. span, as many over them, and three stories of small arches occupying the piers. These works are illustrated and more fully described in the *Detached Essay*, AQUEDUCT. A portion between the third and fourth hills, within the city, and called the aqueduct of Valens, built about 366, also said to have been rebuilt by Suleiman, was 3,600 ft. long, but is now only 1,700 ft., and 70 ft. high, having two rows of large semicircular arches, built of alternate layers of brick and stone. An aqueduct was built in 1730 to supply Pera, Galata, and the neighbouring villages, in part of which is used an arcade or bridge supposed to have been built by the Greek emperors; it is about 884 ft. long and 168 ft. high in two tiers, the upper one of which has been destroyed. The engineers, instead of repairing the bridge, have employed the system of towers and pipes called *souterrasi*; one is said by SALZENBERG to be apparently of the Byzantine age; this is detailed in the *Detached Essay*, and by ANDREOSI, *Const.*, etc., fol., Paris, 1828; GENIEYS, *Essai sur les Moyens*, etc., 4to., Paris, 1829; *Carte des environs de Const.*, Paris, 1829; and in BAUZEITUNG, 2nd series, pl. 523, which has been translated in the *CIVIL ENGINEER Journal*, xvii, 84, 167, and xviii, 163.

Nine ancient reservoirs or cisterns are named by various writers; some are ruined, one was altered into a mosque afterwards burnt, and others into gardens. That of *Yèrè Bata*n

*Serai*, or the subterranean palace, adjoining the Seraglio, still serves its original purpose, having water 5 to 15 ft. deep according to the season: and that of *Bin-bir-dirék*, of Constantine, of Philoxenos, or of the 1001 columns (near the mosque of Achmet), containing an area of 20,000 square feet, are the largest; the latter and a smaller one have long been used as workshops for silk spinners. Amongst the most elaborate ornaments of the city are the *sebeels* or public reservoirs and fountains; the chief, besides that of white marble at Tophana, are those called of the executioner (the *souuk-tshesme* or *jellad-tshesmessi*), of Simeon, of Sultana Zeinab, and especially one (1703-30) before the great gate of the Seraglio, which is a large quadrangular structure, and a beautiful example of its style; ROBERTSON gives ten of them in the photographic illustrations. Of the public baths or *hammam* there are said to be a hundred and thirty, having very plain exteriors, but divided into a number of circular rooms lined with marble and covered by domes perforated for small hemispherical glasses forming thickly studded windows: the finest bath is attached to the mosque of Mahomet II, having three large halls paved with marble, and exhibiting capitals and other ancient works, which are probably remains of the baths of Zeuxippus.

The total number of mosques of all kinds in the city and its suburbs is about three hundred and fifty-six; according to BRARD, *Mineralogie*, 8vo., Paris, 1821, ii, 27, they are paved with flags of a calcareous stone from the quarries at Pappenheim in Bavaria. The imperial mosques are variously stated as being seven, fifteen, and twenty-six in number; except that of Achmet, which is the only one in the empire that has six minarets (that at Mecca having seven), they each have four minarets. That of *Aya Sofia* (the Eternal Wisdom), was erected about 325, and burnt for the second time 532, when the erection of the present edifice was entrusted 537 to Anthemius of Tralles and Isidorus of Miletus; the eastern half of the dome fell 557; the crown was rebuilt about 20 or 25 ft. higher, the counterforts were strengthened, and the interior was renovated 563 by Isidorus the younger: in the latter part of the tenth century (987) a part of the dome that had fallen was restored, as well as the western arch under the cupola, which was decorated with mosaic work; and the eastern arch about 1345. *Aya Sofia* was dedicated to the service of Islamism 1453, when the fittings of the parts reserved for the clergy were destroyed. The minaret at the south-east angle was built with the heavy buttresses by Mahomet II, 1451-81 (FOSSATI says by Selim and Amurath); Selim II added that, but somewhat lower, adjoining at the north-east angle (1566-74), and restored the eastern half cupola; the two western minarets were built by Amurath III (1574-95). The orientation of the mosque rather inclines to the south, as in most of the mosques in Constantinople, pointing in the direction of Jerusalem. It is vaulted throughout with alternate courses of brick and stone, the bricks generally 14 ins. square by 2 ins. thick; some in the lower part of the great cupola are 27 ins. by 9 ins. by 2 ins. thick, others are 27 ins. square; the mortar is of a reddish colour, and the joints vary from 1 to 2 ins. in thickness. A course of stone 2 ft. high is laid in the walls all round the building, about 4 ft. above the pavement. Of the columns (the largest 25 ft. 6 ins. high, 3 ft. 7 ins. diameter), eight in the four exhedrae are of deep red Thebaic porphyry, the rest being mostly of verd antique. The capitals, bases, and some of the shafts, with the ornamental cornices, entablatures, the parapets to the galleries, the window reveals and subdivisions, are of marble from the island of Marmara (anc. Proconnesus). Molded bands of bronze 9 to 11 ins. deep are fixed at each end of the shafts of the columns, either for security or to conceal injuries. All the vaults which serve as roofs are covered with sheets of lead a quarter of an inch thick, fastened to wood laths resting on the vaults without any wood roofing. The narthex or porch, 197 ft. long by 33 ft. wide, opens into the mosque on one side, and on the other into the atrium, which was originally enclosed by walls and sur-

rounded on three sides by open porticos with marble columns and brick piers alternately, supporting a vaulted roof. The low buildings forming the residences of the Imāms have been built between the remaining portions of the porticos. Excepting that the representations forbidden by the Koran were still left concealed, the building was renovated 1847-8 under FOSSATI, by whose directions many additions were destroyed, the exterior was stuccoed and painted with alternate yellow and red bands, the golden mosaic vaulting was cleaned, and the marbles of the interior were repolished. The principal dimensions are: total length, exclusive of the eastern apse, 241 ft.; width 224 ft.; internal length 143 ft., and width 269 ft. Between the four main arches (two of 100 ft. and two of 72 ft. span) in the centre, pendentive vaults are introduced which meet in a circle 100 ft. in diameter. At the springing the dome is 104 ft. wide between the ribs, with 18 ft. rise, forming a flattened shape, and having forty windows each 4 ft. 9 ins. wide; the crown internally is 179 ft. above the pavement. This dome is accompanied by two semi-domes and six smaller ones. The main enclosing walls are 70 ft. high and 3 ft. 6 ins. thick on the north and south sides, 4 ft. 6 ins. on the east, and 5 ft. on the west between the nave and the narthex. These dimensions are in Prussian feet, each being equal to 1·03 English.

The mosque of *Agios Ioannes* is attributed to the year 463, and is said to be the only example of the Roman basilican type remaining in the East; it has a timber roof and vaulted apse, and on each side of the nave two tiers of columns belonging to a Composite order.

*Kutluk Aya Sofia*, little Sta. Sophia, also called *Agios Sergios*, was dedicated to SS. Sergius and Bacchus, and is an example of a transitional style, having been one of the first built by Justinian (500-550); it is circular, with a dome supported on eight pillars between which is a double range of verd antique and white marble columns of an Ionic order.

*Aya Irene* (700-800) in the Seraglio, and now used as an armoury, follows the type of Sta. Sophia, and has a cupola.

*Aya Theotokos* (875-900), illustrated in GAILHABAUD, *Mons*, ii, pl. 37-9, has also a cupola.

*Agios Pantokrator*, now called *Seirek Djami* or *Kilissé Djami* (1100-50), possesses in addition to a cupola, the peculiarity of a double narthex; a large porphyry sarcophagus is exhibited.

The mosques of *Fatihe Djami* and *Günlü Djami* were Greek churches; the last above all has ancient Greek fresco paintings; both are situate near that of *Selim*: and lastly the *Imrachié Djami*; this was formerly the church of S. John Stadium, with which was connected a very large convent, and is remarkable for its ancient paintings.

The following are the chief mosques erected by the Turks:—

The *Mahomedieh*, or that of the Conqueror, erected for Mahomet II by the Greek architect Christodoulos, 1469-9, with materials from the church of the Apostles; an earthquake (1761) is said to have necessitated great repairs in 1768; this with one built 1458, also by Mahomet II, but rebuilt by Selim III, 1789-1808, in the suburb called Eyoub, are held so sacred as to be still closed against Christians. The size of the Mahomedieh is about 100 ft. by 150 ft.; behind it are the tombs of the founder and his family.

That of *Bajazet II* (completed 1505), which has a number of verd antique, jasper, and Egyptian granite columns.

That of *Selim I*, finished 1526; with marbles brought from Alexandria.

That of *Shahzadeh* or *Seheherazadeh* for Suleiman I, 1544-9.

The *Suleimanieh* for Suleiman I, built 1550-5 by Sinan, the greatest architect of the Ottoman empire, mainly with the materials of Sta. Euphemia at Chalcedon, is still the largest and most splendid of the Turkish mosques in the city; the quadrangular court 234 ft. long by 227 ft. wide, is surrounded by cloisters with columns of Egyptian granite 60 ft. in height brought from Ephesus, and others of porphyry; each side is roofed by seven domes, and the front by nine others; on the side opposite the entrance are some stained glass windows, being spoils from Persia, (also said to have been done by Persian artists); two porphyry columns 13 ft. in circumference stand to the north, and two more to the south of the dome, which is said to be of the same diameter as that of Sta. Sophia, but 21 ft. higher; with two spacious courts; a careful plan is given in GRELOT. Suleiman's mausoleum in the 'garden' is an octagonal building covered by a dome.

That of *Osman*, begun for Mahomet III (1595-1604).

The *Ahmediye*, or that of Achmet I, 1610-14, on the Hippodrome, is less spacious than Aya Sofia, and less elegant than the Suleimanieh, whilst it is superior to both in external effect, and is chiefly remarkable for the immense size (12 ft. diameter) of the four columns supporting the central dome, which is about 80 ft. in diameter; its cloistered court is very fine. It has six minarets.

That of *Sultana Valideh*, built for Terhan Sultana, the mother of Mustapha II and Achmet III, 1696, has only one minaret, and is principally of timber. This has also been called *Yeni* (or New) *Djamesi*.

That of *Ayazma* (Holy Fountain) at Scutari, founded by the same in 1711.

That of *Achmet III*, 1703-30.

The *Osmanieh*, erected for Osmyn III, 1745-57, by Greek architects: it has a dome which covers the whole edifice.

The *Laleli* or the *Tulip*, founded by Mustapha III, 1760, who also 1783 founded that of *Abdul Hamid* in the village of Istavros or Stavros.

That of *Selim III*, 1801, near the north gate of the great barracks at Scutari.

The *Nusretiya* or of the Victorious, 1835, at Tophana, for Mahomet II, is distinguished by the lightness and beauty of its minarets.

The *Yeni Djami* or new mosque, 1840-5, of white marble, for Abdul Medjid.

The *Arab Djami* in Galata, which is the oldest of all the mosques in the environs, was built about 1550 for the brother of Suleiman I.

There are about thirty-six Christian churches, of which the Greek cathedral of *Agios Ghiorghios*, or S. George, is the largest and best conditioned Christian temple in the city; it accommodates 600 or 700 persons at one time; that of Mitachi; of the patriarch of Jerusalem; S. Nicolas; S. Polycarp, near the gate of Psamatia, at its south end has a dome 36 ft. in diameter built by Selim III about 1830; the Armenian church, built at the same time, consists of three large contiguous buildings opening into each other by doors, two being for men and one for women, who do not sit together; a few paintings at the altar are the only decorations; S. Basil; the church of Nardhos; and the ancient church of S. Theodoric. The church of the Virgin, *Moné tes Koras*, is illustrated in DALY, *Revue*, 1840, p. 13.

The Greek church in Pera was built by the Russian government. The Roman Catholic monasteries in the suburbs are unimportant. The *Journals* for 1857 and 1858 contain the progress, and result of the competition for the 'Memorial Church'; William Burges obtained the first prize.

The *kiosks* or palaces are numerous; the most remarkable consist of that in the Sultan's gardens at Tcheraghan on the Bosphorus, by W. J. Smith; it is of two stories very richly decorated: the imperial kiosk at Tophana, facing the Seraglio point, was also designed by him for the Sultan, and having been erected on a swamp is said to be the only instance in which concrete has been used in the city; it is about 75 ft. by 40 ft., and of two stories, constructed of brick plastered over, the projections being of stone: the architecture is florid Italian; the roof is flat and covered with lead; the total cost was about £10,000; a view is given in the *BUILDER Journal*, xi, 607: the *yallî koshki* is an octagon edifice on fifteen columns of marble, erected by Sinan Pacha, general of Selim I (1512-20).

The new Seraglio or *serai-bournou*, the palace of the Ottoman sovereigns, occupies the site of the ancient city of Byzantium; the original buildings and the celebrated principal entrance, a large pavilion dated 1472, with eight openings over the high plain semicircular archway (which is the *sublime porte*), were erected by Mahomet II; the palace, inclusive of the gardens, courts of offices, and detached buildings which have been capriciously added at various times, occupies an irregular space about three miles in circumference, but externally there is little to be admired except on the water sides.

In the grounds are the mint, *zarphana*; the palace of the government, rebuilt about 1812 and thoroughly repaired 1827; the armoury with its museum, formerly the Greek church of S. Irene. The seraskier's tower or fire tower, *yanguen-kiosk*, of white stone, about 240 ft. high, and situated on the highest ground in the city, marks the site of the old Seraglio; a picturesque termination was replaced by the present unsightly one about 1835.

The bazaars or *tcharchi*, though numerous, are not very remarkable avenues; these arcades are long, and have an arched or pointed roof of brick, with apertures for the admission of light; the walls and vaulting are generally painted with ornamental devices. The great bazaar, built by Mahomet II (1451-81), re-edified and enlarged at later periods, is of considerable extent; two bazaars are given in the ILLUSTRATED



News, xv, 261, and xxiii, 321. The hundred and eighty (or two hundred) *hans* or *khans*, or lodging houses, are of stone, and perfectly plain; each encloses a court-yard with a few trees; the finest is the Valideh khan, having warehouses and stabling on the ground floor, with three ranges of small chambers over. A hundred and thirty *serai* or free inns, each accommodating from 100 to 1000 persons, consist of open squares surrounded by rooms on two or more stories. As many hospitals are said to be constantly occupied. The numerous cemeteries, mostly outside the western walls, are of great antiquity, and extend for miles. That of the Armenians is pre-eminently beautiful. The mosque and cemetery of Eyoub are also noted; and the Grand Champ des Morts at Pera forms a promenade. The university by G. Fossati, of great extent, is being built of stone and brick; the works were stopped 1852. A library is attached to each of the imperial mosques, and there are about forty altogether now existing.

Many of these objects are described by a local historian in EVLIYA, *Travels*, 4to, London, 1834. Most of the following notices have been condensed from notes kindly furnished by W. J. Smith, Esq., who has partially revised the foregoing remarks.

Until a few years since, the barracks attracted most attention after the mosques and fountains, and that only on account of their extent, as they consist merely of rubble walling. The cavalry barracks in Pera were erected by Selim cir. 1820, and consist of a quadrangle having three fronts, the fourth being stabling; another by him near the Seraglio is very fine; the barracks of the imperial guard at Scutari, also by him, are of the same shape, with workshops on the fourth side, and will accommodate 15,000 men; the cloisters are arched. In 1840 Fossati erected the barrack adjoining the commander-in-chief's offices; it is of two floors with another in the centre, and is built of brickwork plastered over. The military college at Dolma Baktché has the main building of three sides of a square, in the centre of the fourth is a kiosk-like edifice containing lithographic presses; a garden court contains a mosque in the centre; the extreme end having two great halls for study. The cavalry hospital at Geumush-souyou, overlooking the Bosphorus, was designed by W. J. Smith; it forms three sides of a parallelogram, and is two stories in height, the upper one containing wards of different capacities, making up two hundred beds, the lower story is devoted to the accessories of the hospital. The building is warmed by hot water, which is also used to heat the Turkish bath attached; the frontage is 350 ft., and has pilasters placed on a basement. The barracks on the Grand Champ des Morts in Pera was originally designed by W. J. Smith as a school of medicine. During the late war it served as an hospital for the French troops, and contained 4,000 beds. The principal fronts are 550 ft.; the form is not quite a double square, and the interior court, of large extent, has corridors; the front next the Bosphorus has five stories, the others four including the story at each angle which rises above the rest; it is built of brick and stone, and contains an entrance portico of six columns, and pilasters between the windows on each story. The cannon foundry at Tophana is a magnificent establishment, dating from the time of Sulciman I. The hospital of the imperial guard, at the same place, is perhaps one of the finest of its character in Europe. The marine arsenal or *tersaneh*, built 1576, is one of the finest in the world; a quay about a mile and a half in length has depth of water for ships of the line. The buildings are gaily painted. The dry docks are by a French engineer, one is nearly 350 ft. long. The riding house and stable attached to the polytechnic school was designed by W. J. Smith; the former is 160 ft. in the clear by 70 ft. wide and 70 ft. to the apex of the roof, which is open-trussed and tiled; the plan is a Latin cross, the stables running at right angles to the house; the frontage is 250 ft.; the portico has four Tuscan columns with a pediment, of the height of the building.

In 1831 a fire destroyed the greater part of Pera, including

the ambassador's residences of the English, French, and Russian governments. The Russian palace, the most extensive of the three, erected 1838-47 by Fossati, is three stories high towards the street, and four towards the Bosphorus; the façade is about 250 ft. long and about 60 ft. deep, composed of a colonnade of the Corinthian order along part of the front; the lower story is externally of a calcareous stone, the remainder of rubble work plastered and coloured; the roof is partly a terrace of concrete 9 ins. thick, and partly a span roof covered with iron. The French embassy, the least in extent, erected 1840-8 by Laurecisque, is of the Renaissance style, with pilasters; the side next the street, elaborately carved in intaglio, is of three floors, that next the Bosphorus of four; the exterior walls are built of single blocks of Maltese stone about 15 ins. thick, the interior faces being rubbed smoothed, and painted. Adjoining is a small chapel dedicated to S. Louis, elegantly painted and having stained glass. The English palace, between them in size, erected 1845-8 by W. J. Smith, is Italian, of three stories, with an upper one obtaining light from an interior court; it measures 159 ft. by 117 ft.; the four façades are of solid blocks of stone backed with rubble work; the grand staircase is of marble in three flights, with columns and pilasters supporting a groined ceiling; *BUILDER Journal*, v, 98.

The theatre, erected by W. J. Smith, is of a horse-shoe form, and contains three tiers of boxes, with gallery, pit, and stalls; the roof is 70 ft. in span; the stage opening is 32 ft. wide.

The Sultan's new palace at Dolma Baktché, 1853-5, was designed by an Armenian. The frontage is about 1000 ft. long, and of great extent in the rear; in the centre is a large hall, 150 ft. by 130 ft. and 125 ft. high to centre of dome. The façades, of stone and marble, are designed in a very florid Corinthian order, of very common workmanship. A view is given in *BUILDER Journal*, xi, 643, and *ILLUSTRATED LONDON News*, xxiii, 345, in which is also given, p. 297, the costly entrance gateway. The winter garden attached was designed by W. J. Smith, and is formed of iron and glass; in the centre is a basin of enameled slate richly painted, and a crystal fountain of large dimensions.

Besides the authors incidentally referred to in the text, consult GYLLIUS, *De Constant. Top.*, 24mo., Lug. Bat., 1632, translated by BALL, 8vo., London, 1729; DUFRESNE DU CANGE, *Const. Christ. Hist. Byz.*, fol., 1657 and 1729; GRELOT, *Voyage to Const.*, 8vo., 1683, containing many plans; VON HAMMER, *Const.*, 8vo., 1822; CHEVALIER, *Voyage de la Propontide*, etc., 8vo., Paris, 1800; MACFARLANE, *Const.* in 1828, 4to., 1829; GIBBON, *Decline*, etc., chap. xvii, and chap. xl, sec. v; *Const. and its Environs* (by Commodore PORTER), 12mo., New York, 1835; PARDOE, *Beauties of the Bosphorus*, 4to., 1839; and *City of the Sultan*, 4th edit., 8vo., 1854; WALSH, *Const. and the Seven Churches*, 4to., 1838; and *Residence*, 8vo., 1836; LEWIS, *Views in Const.*, fol., 1836; ROBERTSON, *Twenty Photographic Views*, fol., 1853; FOSSATI, *Aya Sofia*, etc., fol., Lond., 1852; SALZENBERG, *Alt Christliche bauldenkmale Const.*, etc., fol., Berlin, 1854; Papers read at the Royal Institute of British Architects by BURGESS, June 26, 1854; by NELSON, Feb. 5, and by WYATT, Feb. 19, 1855; these three are reprinted in *BUILDER Journal*, xii (refer to p. 111) and xiii; PORTER, *Turkey, its History*, etc., 8vo., 1854; and FERGUSSON, *Handbook of Arch.*, i, 465; ii, 943, with whom it may be said, that "it is very much to be regretted that we have neither any verbal account of the mosques, nor any illustrations which can be depended upon. The best are those published by Grelot as long ago as 1680; since then we have had nothing but flippant remarks or picturesque sketches, far more likely to mislead than to instruct; and indeed it still remains for some traveller to visit Constantinople, with sufficient taste to discriminate what is good from what is bad, with sufficient knowledge of architecture to describe intelligibly what he sees, and above all, with sufficient love of truth to induce him to ascertain measurements and facts, and to record them honestly." A plan of the city is

given in No. 171 of Maps issued by the Society for the Diffusion of Useful Knowledge.

CONSTANTINOPLE ( . . . . . OF). Between 1180-93 Sebastiano Ziani, doge of Venice, induced two architects whose names have been lost, to visit that city. The existence of one of them, who has been already mentioned s. v. BARATTIERO, is allowed by SELVATICO, *Architettura*, 4to., Venice, 1847, who denies the employment of any but Italians in the erection of S. Mark's church. The story of the *Anonymous* of Constantinople is given without authority by MILIZIA in v. *Buono*; and VASARI, *Vite* (introduction), and later writers, speak in an equally loose manner of Greek masters being employed on that building from 973 until 1140.

CONSTANTIUS, who died A.D. 441, is commemorated by the inscription P. CC. DD. NN. Valentiniani et Anatoli die xv kalendus Maias Constan. . . . . depositus in pace qui vixit annis LXX mens . . . . . Constant. . . . . arcit . . . . . qui fuit, given in GUTHUS, *Inscriptiones*, fol., Louvain, 1731, p. 372, iii.

CONSTRUCTION. That branch of the science of architecture which relates to the practical execution of the works required to produce any structure. It is the scientific or technical, as opposed to the decorative, part of the study of the architect. It would therefore be necessary in a regular treatise on the subject to consider the properties, qualities, preparation, and application of the materials, i. e. the principles of construction, under divisions corresponding, more or less exactly, with the physical laws or the practical requirements coming within the sphere of the architect's observation. These are either scientific as regards the distribution of weights, thrusts, etc., and such other skill as requires attainments superior to those of the mechanic; or else they are technical, and such as belong to the presumed acquirements of the superintendent of the works.

KOPP, *Beitrag zur Construction der Altdutschen Bauart*, fol., 1831 and 1834; MAGNIER, *Manuel du Const.*, 8vo., 1814; MIGNARD, *Guide des Const.*, etc., 8vo. and fol., pl., 1847; RONDELET, *Traité, etc., de l'art de bâtir*, and supp. by BLOUET, 4to. and fol., 1849; BELIDOR, *La science des Ingénieurs*, etc., augm. par NAVIER, 4to., 1814; BORGNI, *Traité élémentaire de C.*, 4to., 1823; BRUYÈRE, *Etudes à l'art des C.*, fol., 1823; BULLETT, *Arch. pratique*, augm. by MAZOIS, 8vo., 1824; DOULIOT, *Cours élémentaires de C.*, 4to., 1826-35; SCANZIN, *Leçons d'un cours de C.*, etc., 5th edit., 4to., and pl. fol., Paris, 1852; MAHAN, *Elementary Course*, edit. by BARLOW, 4to., 1843; DAVY, *Architect*, etc., *Constructive Manual*, 8vo., 1839; DOBSON, *Rudiments of the Art of Building*, 12mo., 1849; the article in VIOLETT LE DUC, *Dict.*, s. v.; and other works named under ARCHITECTURE, etc.

CONSTRUCTOR. This word, where it occurs in the mediæval accounts of buildings, must be generally, perhaps always, understood to mean the person who caused the erection of the edifice: thus BEDE, *Hist.*, iv, 6, calls Saxulfus *constructor et abbas* of Medeshamstede, but Saxulfus terms himself *fundator*, and there is no direct testimony that he was the architect, although the chronicles mention the *domus studio abbatis Saxulfi condita*: GUNTON, *Hist. of Peterborough*, and supp., fol., London, 1686.

CONTACT. Objects which are placed so near each other as actually to touch, are said to be in contact, and many curious phenomena may be observed, which ensue from the contact of building materials, of a nature materially to affect their powers of resistance to external agents. Thus the contact of mortars with certain descriptions of stone will give rise to fresh chemical combinations, which will increase the hardness of both the stones and of the mortars within a perceptible distance (LIME); or again, the contact of two metals, such as lead and iron, copper and zinc, will develop a galvanic action in any water flowing over them, which will materially increase its solvent properties (GALVANISM). The capillary action of some materials depends greatly upon the manner in which they are

brought in contact with sources of moisture; and it is for this reason that when the end grain of timber is to be placed towards the ground means should be taken to prevent its being placed in actual contact therewith.

G. R. E.

CONTANAGUR (properly *Contanagara*). A town in the district of Dinagepore in Bengal. It is now only remarkable for one of the finest Hindoo temples in the province. 102.

CONTANT (PIERRE), born 11 May 1698 at Ivry sur Seine in France, whence he was generally called Contant d'Ivry, became controller of the buildings of the duke of Orleans, architect to the king, and controller of the buildings at the hôtel des Invalides. He was distinguished as a garden-architect by his works at S. Cloud, where he erected a belvedere (destroyed 1755), and at other country residences; and also as a designer of decoration by his alterations 1747 of the hôtels de Broglie and de Thiers, built by Bullet 1697 for M. Antoine Crozat, in the place Louis le Grand (now Vendôme); at about the same time, of the house built by Gabriel 1717 for M. Blouin, in the rue du fauxbourg S. Honoré, according to BLONDEL, *Arch. Fran.*, fol., Paris, 1752, i, 238, iii, 42, 106, 108, 109, 146, 149; who also, iii, 40, gives a plan of the additions made by Contant (besides altering the roof of the *cour principale*) at the palais royal for the duchess of Orleans, being the mass of new buildings forming that side of the *cour des fontaines* or *basse cour* which is next to the *grande cour* of that palace. The decorations of these new buildings were given as a model in the plates 29-37, s. v. *Architecture*, in the *ENCYCLOPÉDIE MÉTHODIQUE*, fol., Paris, 1762; those of the state bedroom or *chambre de parade*, are engraved in BLONDEL, *Cours*, 8vo., Paris, 1771, v, 107, pl. 49-51. Contant published seventy-two plates of *Œuvres*, fol., Paris, 1769, which should be called *Projets*, as his executed works were to form another volume. This book gives his portrait, and his first design for the abbaye royale de Panthéon, which was erected by Contant in the rue de Grenelle, fauxbourg S. Germain, and is said by VIRLOYS, *Dict.* s. n., to have been copied from a design by Palladio published at the end of the collection of the works of Inigo Jones, engraved in London. Contant was also one of the competitors about 1750 for the arrangement of the place Louis XV, now de la Concorde; and his plan and elevation for a new hôtel-de-ville were published by PATTE, *Monumens*, fol., Paris, 1767, p. 201, pl. 50-51; who has also given, p. 126, pl. 9-11, his plan, elevation, and section of the parish church called la Madeleine de la ville l'Evêque, in the fauxbourg S. Honoré, of which the first stone was laid 13 April 1764, the walls were carried to a height of 15 ft.; the foundations are described in PATTE, *Mémoires*, 4to., Paris, 1769, p. 192; the work was afterwards confided to and altered by the younger Couture, so much so that his pupil Beaumont with Montaignon published, under the name of Contant's son-in-law Dulin, a *Letter* (now rare because suppressed by the government) containing the plans of the three artists. Besides these works by Contant, are the maison de Saucour, behind the Madeleine (PATTE, *Mon.*, p. 6); the additions to the first floor of the principal *corps-de-logis* of the hôtel de Soubise (*Arch. Fran.*, ii, 158); the new buildings of the hôtel de Longueville, opposite the Tuileries, for the *manufacture du tabac*; and out of Paris the château de Bissy near Vernon, or near Gisors, and the church of S. Vannon, at Condé in Flanders. The idea of rendering the great gallery of the Louvre useful for pictures and statues was suggested by Contant, who wished that its contents, being two hundred models of fortified towns, should be placed in the semicircular porticos intended by J. H. Mansart, at the back of the hôtel des Invalides. He died 1777.

5. 68.

CONTE (GUIDO DEL), see FASSI (GUIDO).

CONTE, or CONTINI, or CONTINO. BERNARDINO CONTINO wrote *Prospettiva Pratica*, fol., Venice, 1645 and 1685, if there be no earlier edition. It is suggested that this is the same, or a son of, B. Conte called *fratello di A. da Ponte* by STRINGA, in his notes on SANSOVINO, *Venetia*. At all



events that B. Conte built the church of S. Giovanni Nuovo, reconstructed at Venice by Luchesi. SELVATICO, *Architettura*, 8vo., Venice, 1847, pp. 361, 367, mentions the works in tombs executed by B. Contino, and states that the *prigioni* in that city were commenced by da Ponte, who died 1597, and was succeeded in those works by Antonio Contini, who is called his nephew by TEMANZA, *Vite*, 4to., Venice, 1778, 516.

CONTI (GIOVANNI ANTONIO) completed at Bologna in 1700, the Hungarian college designed by G. and G. A. Torri, now the Venturoli college of architecture; and in 1705 successfully competed against Torri, Albertoni, and Laghi, for the direction, until his death in 1730, of the arches of the portico della Salita, between the arco del Meloncello and the church of the Madonna della Guardia, outside that city. 105.

CONTINI (PIETRO). He with others assisted M. Lunghi in the erection for S. Filippo Neri of the chiesa nuova (Sta. Maria in Vallicella) at Rome, where he died 1595, according to PASCOLI, *Vite*, 4to., Rome, 1736, ii, 552, who gives the inscription on his tomb as dating 1603. CONTE or CONTINI.

FRANCESCO, a son or grandson, designed the church dedicated to the Assumption of Sta. Maria Regina Cœli, to which the convent (also said to be by him) of the Carmelitane Scalze riformate, in the via della Lungara, was attached 1654 by Anna Colonna, widow of Taddeo Barberini, a nephew of pope Urban VIII; was much employed by the Barberini, by families resident beyond the Papal States (and at Venice to build 1630-4 the churches of S. Agostino, Sta. Anna, S. Raffaele, and the capuccine alle *Fondamenta nuove*, TEMANZA, *Vite*, 4to., Venice, 1778, 518); became 1650 a member of the Academy of S. Luke; and received a cross from one of his pontifical employers.

GIAMBATTISTA, a son of this Francesco, was a pupil of Bernini, and his works are described by the same author as consisting of the decoration of three altar pieces; the construction of the chapels of cardinal Delci, before 1670, in Sta. Sabina all' Isola; of Giuseppe Capocaccia in Sta. Maria della Vittoria; of the Marcaccioni in the arciconfraternita della B. Vergina del Suffragio, in the strada Giulia; and of cardinal Altieri in Sta. Maria in Campitelli; this last was so successful that the patron received the artist as one of his clients. He modernized or reconstructed for cardinal Pico a palazzo opposite that called del Conestabile; erected the church (or chapel) now near to the (museo?) *Clementino*; arranged the botanic garden at S. Pietro in Montorio, and planned the casino there; built the domestic dwelling near the palazzo of the Chigi family; designed 1639 the catafalque for pope Innocent XII: went to Vetralla and to Vignanello to build the parish church at each place; after his return he built the palazzo della Badia at Monteroso, for cardinal Altieri; commenced at Rome the church della Sagre Stimate, sometimes ascribed to his father, which he abandoned to A. Canevari; and superintended part of that of the convent of the Turchine. Pope Clement XI, 1700-21, gave a cross to Contini, who at the time was a member of the Roman Academy, as well as architect to the camera Apostolica and to the acqua di Trevi, for he appears to have been consulted on the Roman hydraulic works of any importance. The tower of the cathedral at Zaragoza in Spain, and perhaps the restoration of its capilla del Sagrario also, were designed 1683 by this Contini, who died 15 October 1713 or 1723, aged seventy-two or eighty-two years, the later periods are most probable. 5. 42. 66. 68. 105.

CONTRACT. The agreement by which a person undertakes to supply labour or materials, or to execute a particular work, for a presumed adequate remuneration. A contract should be *under seal*, but is often *verbal*, or reduced to writing; and even in the case of simple contracts they may be either *expressed* or *implied*; but it is essential to all contracts or agreements that there should be a reciprocal and mutual assent of two or more persons, competent to contract, a good and valid consideration, a thing to be done which is strictly lawful, and a time stated to be the essence of the contract. It must be evident that the preparation of a written contract and its proper

execution, are matters which belong to the profession of law, and not to that of architecture: a solicitor therefore should draw up the contract, for which the architect should specify the conditions that are requisite, in his opinion, to a just completion of the work. Some of the conditions which might be desirable, are given by GWILT, *Encyclopædia*, 8vo., London, 1842, p. 619; BARTHOLOMEW, *Specifications*, etc., 8vo., London, 1846; and WALKER, *Architectural Precedents*, 3rd edit., 8vo., London, 1847. Probably from the solicitor's use of the word *specify*, many practitioners have fallen into the error of appending to their specifications not only those conditions which are called general clauses, but also the legal agreements to perform the works, to pay the price, etc. In consequence the architect becomes liable, if he charge or be paid for such service, not only to a heavy penalty, but also to an action on the part of his client, should a flaw occur in the contract by which a loss is sustained: the validity of the standard provision for penalties, as liquidated damages, has been contested; and the written order of the client for these clauses will not exonerate the architect from the responsibilities. Another general mistake is the omission to name some qualified person to give notices, take possession, or do other legal acts; a position too often assumed, to his own damage, by the architect. So far as the architect is concerned, it is important that the drawings and specifications he prepares for the purpose of furnishing the elements of a contract should contain every indication required for a clear explanation of the works proposed to be performed, and that every work which may be essential to the execution of the design should be previously indicated in the same manner in both drawings and specifications. This is more particularly important when the contract is to be for a "lump" sum without a condition respecting omissions, additions, etc., because in fact any deviation, however slight, from the contract in such case destroys it. When the contract is for the execution of works upon what is called a "schedule of prices", there is not the same necessity for extreme preliminary caution in preparing the drawings; although of course there would be less ground for possible objection on the score of increased value, if the original documents should contain the fullest and most correct details. The province of the architect with respect to a contract is to explain the intended works in all their mechanical details so clearly and distinctly that even unprofessional parties should be able to understand them before the contract is signed, and after that event to watch carefully over their execution; this province constitutes one of the most important and delicate of the architect's duties, and requires great practical acquaintance with both men and things. After all, the best security for the fulfilment of a contract consists in the good faith of the parties contracting, and of the architect who is their umpire. BLACKSTONE, *Commentaries*, ed. 1825; ELMES, *Architectural Jurisprudence*, 8vo., 1827; ADDISON, *Law of Contracts*, 4th edit., 8vo., 1857; GIBBONS, *Law of Contracts*, etc., 12mo., 1857; CHITTY, *Contracts*, 1857; and the articles in the *BUILDER Journal*, 1856, xiv, 296, 342, 352.

G. R. B.

The following general covenants, usually introduced into building contracts, consist of such as are necessary on the part of the contractor, on the part of the employer, and for mutual protection; of course under special circumstances special covenants are introduced.

THE BUILDER to provide all labour, implements, materials, carriage, and scaffolding, as well as measuring rods, etc., and to set out work at his own expense.

To give all necessary notices, and pay all fees.

To make good all damage to adjoining properties arising from the works to be executed.

To perform all the works in the specification, in the best manner, and with the best materials, in accordance with the specification and under the direction, and to the satisfaction, of the architect.

To underlet no portion of the work, (this may occasionally require modification).

To alter any works, defective or otherwise, within a certain time after notice has been given.

The EMPLOYER or his architect to have the power of making any omissions, alterations, or additions, without violating the contract; the amount for such alterations to be assessed by the architect, and to be added to, or deducted from, the contract sum.

That no works are to be considered as extra or as additional to the contract unless ordered in writing.

That any work described in either specification or drawings, though not in both, be executed as if described in both.

That the detail drawings be followed in preference to the general drawings, and the figures in preference to the scale.

That any work implied by the nature of the work, though omitted to be described, be executed as if specified.

That any disputed point be decided by the architect. This is sometimes more fairly drawn, that any dispute be referred to two disinterested parties or their referee.

That should the progress of any of the works be delayed unnecessarily, or be executed in an improper manner, the employer or his architect have the power of employing other workmen and of pulling down works, the costs or other damages to be assessed by the architect, and deducted from moneys due to the builder; or if none due, then to be paid by the builder.

That the works be completed within a specified time, on payment of a penalty for every day the works remain incomplete beyond such date. Sometimes the employer will give a sum per day for the works being executed prior to the specified date. The employer to have the power of carrying on the works after the specified time, upon so many days notice to the builder, and of deducting the expenses from any amounts due to the builder.

That a proportion of the amount for executing the work be paid at stipulated periods on the certificates of the architect.

Recent frauds on the part of certain contractors suggest the propriety of introducing a clause to guard these certificates against covering any wilful or fraudulent deviation from the contract.

Special clauses are occasionally necessary; such as, to enable the architect to appoint persons of his own choice for executing such works as carving, modelling, painting, etc., as require to be executed in a superior or artistic manner, to be included in the contract, and paid for by the builder.

The following list comprises most of the known English mediæval contracts, some of which include specifications: some notices of the existence of foreign mediæval contracts might be collected upon a careful investigation of provincial and local histories.

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| Buildings in thirteenth and fourteenth centuries.                      | <i>A brief Account of Durham Cathedral</i> , 1833.   |
| 1314 House at Lapworth.  | PARKER, <i>Domestic Arch.</i> , 5.   |
| 1395 Masonry of Westminster hall.                                      | RYMER, <i>Fœdera</i> , edit. 1700, vii, 701.   |
| 1395 Tomb of Richard II.   | Ditto, ditto, 795; GOUON, <i>Sépulchral Mon.</i> , i, 107.   |
| 1401 Dormitory at Durham.  | <i>A Brief Account</i> , etc.  |
| 1412 Catterick church, Yorkshire.                                      | SAINTS & RAINE, <i>Descr. of C.Ch.</i> , 1831.   |
| 1421 Bridge at Catterick.  | Referred to in WHITAKER, <i>Richmondshire</i> , ii, 27.  |
| 1435 Fotheringhay church, Northamptonshire.                            | DUGDALE, <i>Monasticon</i> , iii, 162; <i>Mem. of the Oxford Society</i> , 1841.                           |
| 1439 Chapel fittings, and tomb, Beauchamp chapel, Warwick.             | BRITTON, <i>Arch. Antiq.</i> , iv; DUGDALE, <i>Warwick</i> , ed. 1636, 329; BLORE, <i>Mon. Rem.</i> ; etc. |
| 1440 Eton college, Buckinghamshire.                                    | BRITTON, <i>Arch. Antiquities</i> , ii, 89; NICHOLS, <i>Royal Wills</i> ; etc.                             |
| 1450 } King's college chapel, Cambridge.                               | MALDEN, <i>Hist.</i> , 1769; BRITTON, <i>Arch. Antiq.</i> , i; LE KEUX, <i>Memorials</i> , ii.             |
| 1470 } A Jesse altar, S. Cuthbert's ch. Wells.                         | BUILDER <i>Journal</i> , xv, 336.  |
| 1473 } Choir of Freiburg minster.                                      | BUILDER <i>Journal</i> , viii, 183.  |
| 1484 } A timber house at Kirklington, Yorkshire.                       | WHITAKER, <i>Richmondshire</i> , ii, 140.  |
| 1484 } Carpentry for the chapel and school at Waynflete, Lincolnshire. | CHANDLER, <i>Life of Waynflete</i> , 300.  |
| 1486 } Road loft, Merton coll. chapel, Oxford.                         | ARCHÆOLOGICAL <i>Journal</i> , ii, 181.  |
| 1492 } Roof of great tower, Magdalen college, Oxford.                  | CHANDLER, <i>Life of Waynflete</i> , 307, 393.   |
| 1500 } Vanling of choir of S. George's chapel, Windsor, Berks.         | Referred to in ASHMOLE, <i>Hist. of the Garter</i> , 136.  |
| 1616 } Tomb of Henry VII at Westminster.                               | SPEED, <i>Hist.</i> , 1037 8; BRITTON, <i>Arch. Antiq.</i> , ii; ACKERMANN, <i>Westm. Ab.</i> , ii, 140.   |
| 1525 } Erection of Hengrave hall, Norfolk.                             | GAGE, <i>Hist.</i> , 41; HUNT, <i>Tudor Arch.</i> , 19.  |
| 1538 } Burnley church, Lancashire.                                     | WHITAKER, <i>Hist. of Whalley</i> , etc., 208.   |
| 1714 } Great Yarmouth church, Norfolk.                                 | PRESTON, <i>Hist. of Yarmouth</i> , 23.  |

Perhaps "the first *bonâ fide* contract for a building entered into in London was that for Drury Lane theatre, 1811; but the hospital at Yarmouth, and a barrack at Hampton Court, had been done somewhat earlier", BUILDER *Journal*, xiii, 437: that is to say, the Commissioners of Military Inquiry, 1806, Report, iv, 266, give the form of contracts for barracks settled in January 1805, and p. 427-34, the list of the contract and other works.

ARCH. PUB. SOC.

#### CONTRACTION OF MATERIALS, see EXPANSION.

**CONTRACTOR.** The term popularly given to the tradesman or other person who is to be paid for the work which he performs, or the property which he delivers under a contract. The word, although perhaps older in its reference to mercantile and monetary matters, does not appear to have been very frequently applied to monopolists in building matters before the present century. Indeed, HARRIS, *Hist. of Dublin*, 8vo., Lond., 1766, p. 475, styles the architect-engineer Semple 'overseer', and the builder or mason Mack 'undertaker'; and MULVANY, *Life*, 8vo., Dublin, 1846, p. 70, shows that in 1784 Gandon was supposed to be 'a contractor', and as they termed him 'a projector or undertaker'; and that the gentry of Bandon in 1795 called a contracting builder an 'architect'. The Reports of the Commissioners of Military Inquiry, 1806, at first style the builder 'proposer', and afterwards 'contractor': see Rep. iii, 139-141; Rep. iv., 427-434. But except in some works for the English government, the system was not then that which now prevails. In the seventeenth century the existence of "resident surveyors" mentioned s. v. ARCHITECT, as at Wollaton and Holkham, rendered the condition of master-builder precarious, if it even were possible, as a monopolist; but in the eighteenth century there was a change of practice on the part of the clients, who either preferred to have the works measured and valued (sometimes on a schedule of prices), or else employed an architect, who, as in the case of Jupp at the East India House in 1799, made his design and submitted an estimate upon which he obtained advances of money, making with the tradesmen his contracts, which, with the receipts, he produced at the termination of the works to his client; and it was customary for the latter to make a present, beyond the commission, if the works were executed within the estimate; thus £1000 is said to have been given in the cases of this building and of the gaol at Nottingham. The Irish architects, so late as 1803, practised in this manner, as Gandon appears to have done in the courts at the Custom House of Dublin: (MULVANY, p. 182). Of course this system created a class of architects, who, frequently advancing money for their patron, presented an abstract of the accounts, received a gross amount when this bill was sent in, and distributing it amongst the tradesmen, derived a discount or percentage from them; and the architect was more or less openly a builder, as he could make contracts with his client for a higher sum than those delivered to himself: the quarrels and extra charges of tradesmen following each other were avoided, and it must have been often found convenient that there should be only one creditor: Sir W. Chambers was a contractor in the erection of Parkstead at Roehampton 1767, and his contracts for Pepper Harrow 1775-6 still exist; a combination of positions now considered to be derogatory to the interests of the architect and his employer. As the building trade was rapidly falling into few hands, capitalists and others embarked in it, especially about 1815, and then the system of competition contracts with all its stratagems came into full force, especially after the panic of 1825, when many speculative builders found it best to work for others besides themselves. The epoch of the "division of labour" has seen all the trades connected, however remotely, with a building combined in single hands, and has commenced a system of under contracts called sub-letting, which cannot be sufficiently deplored on account of its attendant evils.

**CONTRAST.** It has been well observed by Q. DE QUINCY, *Dict. s. v.*, that most modern languages use this word instead of *opposition*, for the contrariety and dissimilitude by which one thing contributes to the effect of another: the difference of the masses that form a building, whether as solids and voids, or as portions of the edifice varying from each other in height or in plan, the opposition of masses of light to those in which shade is secured; or of curved to straight lines; the alteration of the shapes of roofs, or of the ornamental portions of an edifice; differences of style, orders, character, etc.; all come within the

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scope of this term, although they are agreeable oppositions of difference, and not the startling contrarieties which form real contrasts. 5. 6. 25.

**CONTRAST.** The effect produced by bringing into juxtaposition objects which in subordinate points of expression or character differ diametrically, but which agree in principle and in the general idea; divergent but springing from the same root; and which however varied in individual character are capable of forming one harmonious whole, of uniting in the same composition and of producing but one single idea or impression on the mind. Contrast varies in this respect from "discord", viz. that the latter expresses the juxtaposition of objects differing essentially in principle, producing a different class of feelings, and incapable of uniting together in forming one impression or idea. Contrast is that principle in art by which the skilful artist produces some of his most pleasing effects. He employs it to balance the various parts, to relieve monotony with a graceful variety without disturbing the harmony of the whole composition, and creates by its means within the work itself an artificial scale or standard by which the value and relative positions of the various parts are more effectively and decidedly marked. H. B. G.

**CONTRASTED ARCH,** see **Ogee ARCH.**

**CONTRE-RETABLE,** see **RETABLE.**

**CONTROLLER** or **COMPTROLLER** (late Latin, *contrarotulator*; Fr. *contrôleur*). The official title given to an officer belonging to the royal household, whose duty appears to have been to keep the counter roll of the building expenses. In the reign of Edward III the salary was sixpence per diem, whilst that of the clerk of the works or surveyor was one shilling. BRITTON and BRAYLEY, *History, etc., of Westminster*, 8vo., London, 1836, pp. 148, 198, give the names of several persons holding this office, who seem to have been in orders. The above sums are double in the accounts of James I. Sir W. Chambers appears to have been the first surveyor-general and controller; he was succeeded in the joint title by J. Wyatt, and they were dropped in 1815, when the designation was superseded in the new office of works by that of assistant surveyor-general and cashier. About 1775 the term in France expressed a person, like the modern clerk of the works, employed to keep an account of all the materials supplied to a building, examining their quality, and giving a receipt for them; and to watch the faithful execution of the works according to the drawings and specifications. At the same time the term seems to have been applied to what we now call in England, the surveyor, when speaking of a public establishment or of a company, i. e. to the architect or his successor, who has only to superintend small alterations and repairs. INTENDENT. 5.

**CONTUCCI** or **CONTUCCIO** (ANDREA), born 1460, and called from his birthplace near Arezzo 'da Monte Sansovino', or 'il Sansovino', was the son of Domenico a labourer. He was found modeling in clay whilst tending sheep by the podestà Simone Vespucci, who enabled him to study at Florence under Antonio del Pollaiuolo, and to become an artist, placed only second to Michelagnolo by VASARI, who, in a long account of his various works, mentions the vestibule of the sacristy (the ceiling and the plan are shown in FAMIN and GRANDJEAN, *Archit. Toscane*, fol., Paris, 1848, pl. 44 and 75), and the cappella del Sacramento or cappella Corbinelli to the church of S. Spirito, in that city: several edifices, inclusive of a palace with four towers, perhaps at Evora or Setubal, for the kings John III and Emmanuel, during his residence, 1491-1500, in Portugal (RACZYNSKI, *Letters*, 8vo., Paris, 1846, p. 344): the monuments, completed 1509, to the cardinals Ascanio Marco Sforza (ob. 1501) and Girolamo Basso del Rovere or Recanati (ob. 1507), nephew of pope Julius II, in the church of Sta. Maria del Popolo at Rome (LETAROUILLY, *Rome Moderne*, fol., Paris, 1857, iii, 239-42; casts are in the collection at South Kensington): a design for the façade of the church of S. Lorenzo at Florence, in competition with B. d'Agnolo, G. di Sangallo,

J. Tatti, and Raffaello, against Buonarroti: the decoration of the church, and the continuation on Bramante's design of the town, at Loreto: the design of the house built by Piero Geri, but sold to Pellegrino da Fossebrone, and of the stepped ascent to the cathedral, at Arezzo, where he continued the church della Nunziata, now called the Madonna della Lacrime, chiefly designed by B. della Gatta: his own house at Monte Sansovino, where he built a chapel for the Augustinian monks, the cloister, the decorations of the pulpit and of the middle aisle, as well as a door of a Doric order for their confraternità di S. Antonio. His merits as an ornamentist and as one of the chief exponents of a particular school of art have been mentioned s. v. CINQUECENTO. He died at Monte Sansovino 1529, but his tomb was or is in the church of S. Ambrogio at Florence. His favourite pupil, Jacopo Tatti, was also called Sansovino. 73.

**CONVENT** (the Latin *conventus*). An assembly; subsequently a place where monks or nuns assembled; and finally the buildings they occupied. Three persons could make a COLLEGE, but thirteen were required to form a convent. It may be noticed that while the word convent is generally understood in England to mean a nunnery, its foreign homonyms mean a house of monks, while those of monastery mean a house of nuns; although the term monastery is sometimes used indifferently for either. For notices of the arrangement of such edifices reference may be made to the articles **MONASTIC BUILDINGS**; **AUGUSTINIAN**, **BRIDGETINE**, **CLUNIAN**, etc., **BUILDINGS**.

**CONVENTICULUM.** This word, originally signifying an assembly, was used for an oratory, but it was afterwards understood to mean a building used by a heretical congregation, for which S. AMBROSE, *Epist.*, 17 or 29, uses the word 'fanum'; BINGHAM, *Origines*, 8vo., London, 1840, ii, 346-8, 371-2. The English word 'conventicle' equally meant the room occupied by an assembly for secret, because illegal worship; FULLER, *Church History*, 8vo., London, 1845, iv, 382; and has been extended to such chapels as are not within the pale of the Established Church, although they may be within the protection of the law.

**CONVENTION.** The form that art assumes when it abandons natural types and expression, and creates forms and combinations purely fanciful, capricious, and arbitrary; regulated, however, by certain fixed principles of its own prescription, and which it substitutes for those furnished by nature itself. Convention, however, must be essentially consistent with itself, and must be the development of one fixed and definite idea, and should be regulated by the standard of nature so far as it can be applied to a purely arbitrary creation. The very principle of convention restricts it to the lower departments of art, and excludes it necessarily from all that is noble, intellectual, life-like, and spiritual, from its noblest aims, and from its most elevating impressions, which can only be formed upon the standard and types of nature itself; but it is at the same time absolutely necessary to those lower departments of art in which simple ornamentation, irrespective of higher qualities, is aimed at, and where geometrical regularity of arrangement, the properties of construction and position, and the due subordination of parts are more to be regarded, and where a certain modifications of natural forms is infinitely preferable, more appropriate, and more in the true feeling of art, than the absolute reproduction of those objects counterfeited in all the luxuriance and irregularity of nature; and it will be found that in all the best periods of art, the rule of applying convention to the lower departments of art and natural types to the higher, prevails without exception. H. B. G.

**CONVENTIONALISM.** That general acceptance of some arrangement or disposition in art, or objects of art, at variance with the strict canons of taste or laws of propriety; but admitted by common assent, either from habit or to suit some special purpose or adaptation otherwise unattainable. T. L. D.

The repetition of carpentry in stone, the use internally of

entablatures and pediments, the employment of pilasters, superposed orders, grouped columns, and engaged columns, with many of the usual appliances for decoration, are such conventions: and the term 'conventional' is applied as a reproach to those designs which afford an inconsiderate exhibition of the favourite conventions of the day. QUATREMÈRE DE QUINCY, *Dict. s. v.*, has endeavoured to use the word conventional in a flattering sense, that of attention to the necessary conventions of art.

**CONVENTUAL CHURCH.** The church of a monastery or of a nunnery: this class of buildings is therefore one which presents as many diversities of plan and superstructure as there have been or are varieties of the monastic rules and their subdivisions, of the practice and observance with regard to those rules, of the various fashions in art, and of national circumstances or local accidents. Besides the general notes given *s. v.* CHURCH, such articles as treat of the monastic orders, *e. g.* BENEDICTINE, CISTERCIAN, etc., BUILDINGS, may be consulted for some notice of the chief of these diversities, which would afford scope for a large volume and a lifetime of research.

**CONVERSANO.** A city in the province of Bari in the kingdom of Naples. It possesses a citadel, a very ancient cathedral dedicated to the B. V. Maria Assunta, an episcopal palace, a *seminario*, three convents, and the magnificent monastery of S. Vito. 96.

**CONYERS or CONUERS (JOHN LE)** with W. de Leyre and R. de Refham were the surveyors appointed 1307-10 to superintend the extensive works in the palace of Westminster, the Tower of London, and the king's mews near Westminster, of which a long account is given in BRITTON and BRAYLEY, *History*, 8vo., London, 1836, p. 113.

**CONZA or CONSA.** A city in the province of Principate Ulteriore in the kingdom of Naples. It was nearly destroyed by an earthquake in 1694, but still contains a cathedral dedicated to the Assumption, which, although said to be fine, is chiefly remarkable for its sculptures and antique tombs: the archiepiscopal residence was at S. Menna, and at Campagna, but now is at S. Andrea. 96.

**COO (GIAMBATTISTA)**, otherwise called Johannes Baptista de Covo, succeeded Giulio (Romano) Pippi as *vicario della curia*, and *prefetto delle fabbriche*, at Mantua, 1546, and died about 1549. His epitaph is given by CODI, *Mem. Biog.*, 8vo., Mantua, 1837, p. 52, who observes that he was considered of the highest merit at Mantua.

**COOLEY (THOMAS)**, born 1740 in England, was apprenticed to a carpenter named Reynolds. In 1769 the first premium, £105, for the Royal Exchange in Dublin was obtained by Cooley, who finished it 1779, at a cost of £40,000. He commenced about 1770 for the primate Robinson at Armagh cathedral, a tower which, after being raised 60 ft. above the roof, was taken down owing to the yielding of the ancient piers. Near to and in Dublin, he built the little chapel in the Phoenix Park; the Hibernian Marine Society's school, opened 1773, at a cost of £6,600, on a site 130 ft. long by 106 ft. deep; and commenced 1773 the prison called Newgate, which, although of three stories in height, 170 ft. wide, and 127 ft. deep, only cost £16,000; this may account for the insufficiency of its extent, its bad arrangements, and its wretched execution. His last work was the commencement 1776 of the Four Courts; the western wing having only been completed, at a cost of £16,788, when he died 1784. WARBURTON, *Hist. of Dublin*, 4to., London, 1818, pp. 520, 523, 1047, gives views of the Royal Exchange and Record office, which appear to be reduced from those in MALTON, *Desc.*, fol., Dublin, 1795. MULVANY, *Life of Gandon*, 8vo., Dublin, 1846.

**COOPERTORIUM and COOPERTURA.** The late Latin words for a roof, as *COPPIENDUM* meant a thing being roofed or covered. 80.

**COORAN.** A light brown wood of Penang, used for planks in building. 71.

**COORLAND (GUILLAUME)** in the first half of the eleventh century directed the construction of the imposing edifice called the basilica of S. Hilaire at Poitiers; its remains still indicate the purest type of the *style Romain primitif*. DE GUILHERMY, in the *REVUE GÉNÉRALE*, etc., 4to., Paris, 1840, i, 137.

**COP.** A name given, especially in the north of England, to the mass of earth thrown up in forming a ditch, and used as the saddle-backed base of a hedge, or in some cases left as a fence without any hedge: hence the terms ditch and cop.

**COP** is also applied to each solid or partly solid portion of a line of notched parapet wall; the spaces, if any, being called **CRENELS**: both the cop and the crenel may have a **CREST** or coping. **BATTEMENT.**

**COPAN.** The ancient name of a city, now in ruins, situated about thirty-five miles south of the Golfo Dola, at the head of the Bay of Honduras in Central America. The most remarkable facts connected with them, besides the similarity of type between the sculptured hieroglyphics at CHICHEN and PALLENQUE to those found here, which are painted chiefly red and with one exception are in alto rilievo, are these: 1. The large number both of pillars about 12 ft. high, 4 ft. wide, and 3 ft. thick, carved as statues, generally with a large altar-table about 4 ft. high advanced 8 ft. in front of them; and of colossal monkey heads: 2. The pyramidal base about 600 ft. square, having two lesser conjoined pyramids attached to part of the south side, while the west is formed by a river-wall from 60 to 90 ft. high, built of worked stones from 3 to 6 ft. long and 18 ins. thick; the other sides of the pyramid, rising from 30 to 140 ft. on the slope, consist of ranges of steps; all the steps and the pyramidal sides being painted: 3. Two theatres (?) sunk in the terrace by steps; of these one is about 140 ft. long and 90 ft. wide: 4. One side of the passage to this area is the commencement of another pyramid with steps 9 ft. deep and 6 ft. high: 5. East of the pyramidal terrace is another pyramid about 50 ft. square and 30 ft. high; at the south-west corner of the two conjoined pyramids is an entrance, between two smaller pyramids, from the river to the city. In short the whole of the ruins, having an extent probably of two miles, are pyramidal and built of a soft gritty limestone with flint nodules, according to the vague account given by STEPHENS, *Incidents, etc.*, in *Central America*, 8vo., London, 1841, pp. 95-160, who gives a plan of so much as was surveyed, and about twenty-seven illustrations of the sculptures, some of which are repeated on a large scale by CATHERWOOD, *Views*, fol., London, 1844, pl. 1-5: STEPHENS quotes the interesting account given 1700 by HUARROS in the *History of Guatemala*, and mentions the observations, 1836, of Colonel Galindo, given in the *LITERARY GAZETTE* of that period.

**COPE**, see **COPING**. The soffit of a projecting molding is said to cope over when the soffit inclines downwards from the wall. 2.

**COPEN (JACQUES VAN)**, see **KAMPEN (J. and N. VAN)**.

**COPENHAGEN** (in Danish Kjøbenhavn; late Latin, Hafnia). The strongly fortified capital of Denmark. A great fire, 1728, having destroyed two-thirds of the north-west or old town, it is now more modern in appearance than the new town or Friderickstadt, as the enlargement made 1626 is called. In the walls are four gates, the west dating 1668; the north, with a handsome arch 14 ft. span and 20 ft. 6 ins. high, 1670-99 or 1728; the east 1708; and the south or Amager gate, placed 1724 on its present site, has a colonnade 42 ft. wide facing the road. Of the ten bridges, two only, each 300 and 400 ft. long, are worth notice. Some of the nobility have handsome houses of brick, and even of Norwegian granite; there are a few large and showy hotels.

The principal churches are, that dedicated to the Virgin, which was made cathedral at the commencement of the thirteenth century, and rebuilt 1807-28 by C. F. Hansen, being 215 ft. long and 180 ft. wide, having a hexastyle Greek Doric portico of fluted columns; the apsidal end is domed, and the



front of the choir corresponds; the tower is 200 ft. high: S. Peter, 152 ft. long and 60 ft. high, with a tower 250 ft. high: that to the Saviour, designed by Lambert von Haven 1682-96, having like that of the Sapienza at Rome, a spire, formed on the top of the cupola by an open staircase rising to 288 ft. from the ground; this was added 1749 by Lauritz de Thurah: Trinity church 1637-42, having the university library of 100,000 volumes in the roof; and a round tower 115 ft. high and 84 ft. in diameter, designed for an observatory on the top, by Longomontanus, the pupil of Tycho Brahe, with a carriage road to the summit of the tower; that of the Holmen's or Mariner's, 1617, enlarged 1640: the garrison church, 1704: that of the Holy Ghost, 1728: the Frederick's church in Bredgade, designed by Harsdorf 1749, as a copy of S. Peter's at Rome, but left incomplete on account of the enormous cost: another of the same name in Christianshavn, 1756-9: the Reformed chapel, 1668: and the Austrian ambassador's chapel, 1842, which being Roman Catholic, was denied a bell or bell tower; it was designed by Hetsch, cost £6,750, and is given in the *ALLGEMEINE BAUZEITUNG Journal*, 1850, pl. 326-8, which also gives, pl. 309-10, the *casino-theater* built 1847 by Stilling in the Amalie-Gade. The synagogue is one of the largest and handsomest in Europe. Amongst the charitable institutions are the Meyer almshouses, 1825; the Frederick's hospital, 1751-7, for 350 patients; the S. John's hospital or Bidstrupgaard; the Almindelig, for 300 patients; the military, 1817; and the naval hospital, 1648-70, which is now a fine and spacious lazaretto; besides three other hospitals and twelve charitable institutions, there are the Wartow or Holy Ghost almshouse for 412 persons of both sexes, and a chapel; and a deaf asylum, 1808-28.

A large number of the public edifices owe their erection to Christian IV, 1588-1648, who is said to have been a good architect and to have designed the exchange, 1622-4, the east end is later; the inside, dating 1642, is 406 ft. long by 60 ft. wide; a spire rising 176 ft. is composed of four twisted leaden dragons. Amongst his other works are the copper roofed palace of Rosenborg, 1604 (attributed to Inigo Jones), having a knight's hall 152 ft. in length; its three towers are covered with slates and lead; this building also contains the mint and its museum: the Bremesholten, 1601; the arsenal; the house of correction, 1621; with the Holmen and Trinity churches, in fact nearly the whole of his new quarter, founded 1618, and called Christianshavn. Earlier than that period there is perhaps no building of equal age and importance with the *consistorium* (formerly the residence of the bishops of Roeskild) belonging to the university: the college of Regents was rebuilt after 1728; the library is celebrated for its Runic, Icelandic, and Indian MSS. After the reign of Christian IV there were erected the Guldenslöve, afterwards Charlottenborg palace, 1672, now the academy of arts; the Stokhusel (1699-1730) and five other prisons; the royal theatre, 1748, enlarged 1774, and two others; the Moltke, Schach, Levetzow, and Brochdorf palaces, all alike and now royal residences, which form the *place called Amalienborg*, 1756-65; the extensive and well arranged veterinary college, 1772, a theatre for lectures, and excellent stables; the vegetable market, 1795; and the handsome *raadhuus* or town hall, 1805-15, two stories in height with a hexastyle Ionic portico. The attention of strangers is generally directed to the tower, designed 1820, by Lieut.-Colonel Smith, to the (burnt) church of S. Nicholas; the bronze statue of Frederick V, 1746-66, which is said to have cost £80,000; the Friheds-Støtten or freedom memorial, 1792, of Bornholm stone on a pedestal of Norwegian marble, at a cost of £2,800; and the palace of Christiansborg, four stories in height, with a hexastyle Ionic portico on a rusticated basement, rebuilt 1794-1828 by Hansen, and is at present used for the chamber of Representatives and for the Supreme courts. The chief of the one hundred and thirty rooms are the guard room, 50 ft. long by 36 ft. wide, and the waiting room, 54 ft. long by 34 ft. wide; this building has a handsome chapel with an Ionic portico and

an interior decorated with a Corinthian order under a roof of copper; stabling for two hundred horses with a large riding house; and the museum of antiquities removed from the university: the royal library, with a fine collection of eighty thousand early engravings, occupies a detached suite of nine rooms, the chief saloon being 260 ft. long (with a gallery) over the celebrated arsenal (1604). The treasury and exchequer are in the vicinity. Five or six other museums, inclusive of the Thorwaldsen; the *Classenske* library; a metropolitan (1801) and five other schools; thirteen societies; an athe-neum, and five other clubs; with three military schools, six barracks, the national bank (1775-1800), built of stone; and a civil, a naval, and a military cemetery are the chief other establishments. In the environs are parks, with other objects of interest, such as the old church, etc., of the rich Cistercian abbey of Soroe, founded 1161 and secularized 1580; Herlufsholm in Nestved, 1185; the castle of Cronborg at Elsinore; Hillerød or Fredericksborg castle, 1588-1648, with a council chamber 150 ft. long and the Coronation chapel, 178 ft. long by 41 ft. wide, and a fine riding house by Friis; the palaces of Fredericksberg (Italian style) and Fridensborg (with a theatre), 1699-1730; Lyngby, with the Sorgenfri and the Hermitage or the Summer and the hunting palaces; the palace of Charlottenlund; and the church, 1823, at Hirschholm; but before all these must be placed the magnificent cathedral of Roeskilde, four miles from Copenhagen, built 1084 by the English (like many of the clergy at that time in Denmark) bishop William, chancellor and confessor to Canute the Great, or the Saint, 1076-86; it is now occupied by the royal tombs.

Copenhagen as it existed is given by the engravings after the royal architect, C. MARSELIUS, *Vorstellung*, fol., 1718; as well as by DE THURAH, *Danske Vitruvius*, fol., Cop., 1746; and *Description de la Résidence royale*, 4to., Cop., 1748; and there is an *Intérieur de la grande salle du château royal de Christiansbourg*, 8 Nov., 1766, drawn by Jardin and engraved by Bradt, 1768. ANDERSEN FELDBORG, *Denmark*, 8vo., Edinburgh, 1824, pp. 82-8, gives views of the exterior and court of Fredericksborg palace, also attributed to Inigo Jones, and resembling Heriot's Hospital; HANSEN, *Samling*, fol., Cop., 1825-34; and JONES, *Copenhagen*, 8vo., 1829, also give views of some of the buildings; BREMNER, *Excursions*, 8vo., London, 1840, i., 77-172; RICHARD, *Promenades*, 12mo., Cop., 1848; and ANGELICAN (R. S. ELLIS), *Traveller's Handbook to Copenhagen*, etc., 12mo., London, 1853. A large plan of the city is given in the maps of the Society for the Diffusion of Useful Knowledge, No. 172.

COPING (It. *coperto*; Fr. *chaperon*). The cap or capping of a wall, whether made of plaster, mortar, tile, brick (Sp. *albardilla*), stone, slate, metal, slag, or thatch; the use of planks for coping has been mentioned, s.v. CAP. The section of coping may either represent it with a level top, when it is called parallel coping, and is sometimes used for gables and in sheltered situations; or with the surface sunk or weathered from one side, A, H, when it is termed feather-edged coping, and is most usual; or with a saddleback, C (Fr. *bahut*); or with the surface



weathered from the centre to each side, B, E, F, G, K, and L, which is sometimes also called saddleback coping. In most mediæval work the weathering begins from an astragal, D, on

the topmost part of the stone, and the sunk sides are frequently staged,  $\kappa$  and  $\alpha$ . In any of these cases there is a manifest advantage in allowing the coping to project beyond the face of the wall, and the underside of this projection, if stone be used, has a channel or throating to prevent water from running to the bed of the coping,  $\tau$ ; yet it is not unusual to find a projection on one side only of a parapet in mediæval work,  $\nu$  and  $\epsilon$ . Sometimes the stones have their ends left higher than the rest of the work, and such junctions are called water joints. Stone coping should generally be in large pieces, so as to have as few joints as possible; and in common house building this is necessary to prevent the stones being blown off or tripped up. The stones are often cramped together with copper or stone, in double dovetails, but generally it is only necessary to joggle them and run them with lead. Iron cramps should be always avoided. A common coping,  $\mu$ , is described as brick on edge in cement above a double tile creasing, while  $\kappa$  and  $\lambda$  show the approved modes of coping in brickwork, garden and other walls. When the front of the coping is worked into any form but a vertical face, a molded coping is produced,  $\epsilon$ . *MUSGROVE, Rambles*, 8vo., London, 1855, p. 101, gives two illustrations of the very picturesque triple and quadruple tile coping used in Devonshire and in Normandy, where it is sometimes supported by struts.

**COPPER** (Gr. χαλκός; Latin, *cuprum*, *as Cyprium*, etc.; It. *rame*; Sp. *cobre*; Fr. *cuivre rouge*; Ger. *kupfer*). One of the metals used from the most remote antiquity, and which, on account of its malleability and peculiar conducting properties, is still largely employed in the arts. It is often found in a pure or native state; but generally speaking the copper of commerce is obtained from the ores of the copper pyrites after a long process of roasting, smelting, casting and rolling. Pure copper has a bright yellowish red colour; it is very brilliant and susceptible of a high polish; it has a sensibly disagreeable taste, and when handled communicates a very unpleasant smell; it is highly poisonous when in the state of the oxide or of the carbonate, either of which forms it readily assumes; and is slightly sonorous and very ductile and malleable. Its specific gravity may be taken at 8.910, and as a cubic inch of copper weighs .3225 lb., it is as 1.16 to 1 of wrought iron (7.700), but as 1.226 to 1 of cast iron (7.264); its tenacity is next to that of iron; it is softer than the latter metal, but harder than gold, silver, or lead; it is rather more fusible than silver, and melts at 27° of Wedgwood's pyrometer. Pure copper is very rare; the copper of commerce is generally brittle on account of the portions of the protoxide or of the carburet of the metal which are disseminated through its mass. A still greater brittleness is induced by the presence of BISMUTH, even when only 0.05 of that metal is contained in the copper, to which it gives a grey or black tint according to the greater quantity of bismuth than that here indicated; *LEVOL*, in the *Bulletin de la Société d'Encouragement*. In the Exhibition at London, in 1851, some copper wire was exhibited drawn from one yard per pound to 7588 yards.

In dry air, copper lasts for an indefinite period; but when there is any moisture in suspension, the copper rapidly becomes covered by a coat of the hydrated carbonate of that metal, called incorrectly *verdigris*, or verdigrease. The vegetable acids, fatty oils, sulphuric, nitric, and hydrochloric acids affect copper in variable degrees; but the compounds formed by any of them are as highly poisonous as the simple oxide or carbonate, and it is for this reason that the inner surfaces of cooking utensils of copper require to be coated with tin or some other metal which shall protect them from contact with either vegetables or fats. Copper does not, however, decompose water at any temperature; and thence its frequent use for boilers, especially in positions where it is important to economise radiant heat. It is important to observe that the hydrocarbonate of copper, the so-called *verdigris*, is not soluble in water, and that when once it has been formed it acts as

a varnish to protect the metal beneath. If therefore it could be used with regard to economy, there can be no doubt but that copper would form the most durable covering for roofs, especially in London, or where coal is largely consumed, provided that it can be guaranteed against liquid ammonia, which forms an oxide and then dissolves copper, and that it be used so thick as not to break from the effect of the sun's heat. It is said that if strips of the best zinc, about 8 ins. by 2 ins., were screwed on each course of copper, the galvanic influence would prevent oxidation of the copper. The nave of Chartres cathedral was roofed in 1836-41 with iron ribs covered with copper plates; in 1853 the latter had so much oxidised that they had ceased to protect the masonry; the substitution of lead for this copper had therefore been resolved upon, but in 1857 the alteration had not been made. In the restorations of the chapter house at York, Mr. S. Smirke employed iron dovetail cramps, encased and brazed in copper, in lieu of iron merely, the exfoliation of which bursts and demolishes the masonry; this precaution is now generally adopted.

The brown colour of old copper is owing to a thin coat of oxide; and the peculiar tone of statues or medals which have been long buried is caused by a sub-oxide. The ancient blue glass owes its colour to the deutoxide of copper; but copper generally gives a green; a fine red tint is given by the sub-oxide or red oxide; and other valuable pigments are obtained by the combination of copper with ammonia, sulphur, phosphorus, and lime. Sulphate of copper, also called blue vitriol, Roman vitriol, or blue copperas, is used as a preventative of moldiness (DRY ROT); and it is a powerful preservative of animal and vegetable substances. *ÆS*; *CHALCE*; *CHALCIOECUS*; *CRAMP*; *CEILING*. The alloys of copper are much used in the arts, and have such very characteristic differences from one another and from the pure metals of which they are composed, that they have been described under the heads *BELLMETAL*, *BRASS* and *BRONZE*: blanché copper consists of 16 parts of copper to 1 of arsenic. *DUMAS, Chimie appliquée aux Arts*; *BRARD, la Mineralogie appliquée aux Arts*, 8vo., Paris, 1821; *BENDANT, la Mineralogie*, 12mo., Paris (s.d.); *HÖFFER, Dict. de Chimie*, 12mo., Paris, 1848; *BRANDE, Manual of Chemistry*; *URE, Dictionary of Arts*, etc.; and *WEALE, Engineer's Pocket-book*.

The use of electro-deposition as a means of obtaining statues of pure copper in one piece without seams, as practised at the cathedral church of S. Isaac at S. Petersburg (*MONTERRAND, L'église*, etc., fol., St. Petersburg, 1820), and at the Royal Foundry of Berlin; together with the reverse (from molds) of the process, may be usefully applied for the production of architectural ornaments.

THICKNESS OF COPPER SHEETS.

Number used for the wire gauge .....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Weight of one foot sup. in pounds ....	.1	.13	.14	.15	.16	.17	.18	.19	.20	.21	.22	.23	.24	.25	.26
Number used for the wire gauge .....	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Weight of one foot sup. in pounds ....	.27	.28	.29	.30	.31	.32	.33	.34	.35	.36	.37	.38	.39	.40	.41

or No. 1 =  $\frac{1}{16}$ ; No. 4 =  $\frac{1}{4}$ ; No. 7 =  $\frac{1}{8}$ ; No. 11 =  $\frac{1}{2}$ ; No. 16 =  $\frac{1}{16}$ ; No. 22 =  $\frac{1}{32}$  of an inch; Nos. 22 to 28, or 18 to 12 ounces per foot sup. were used formerly for gutters, etc., but the great variety of thicknesses into which copper is manufactured, in plates of uniform size with the common sheet, 4 ft. long by 2 ft. wide, causes a necessity for naming the weight to determine the thickness, thus: 70 lb. plates =  $\frac{1}{16}$ ; 46  $\frac{1}{2}$  lb. =  $\frac{1}{8}$ ; 23 lb. =  $\frac{1}{4}$ ; 11  $\frac{1}{2}$  lb. =  $\frac{1}{2}$ ; 6 lb. =  $\frac{1}{4}$  of an inch. G. R. H.

**COPPER.** The name given to the vessel, originally made only of copper, but now often of cast iron galvanised, in which water is boiled for culinary and other purposes, and which is usually provided in a scullery as well as in a brewhouse or a washhouse. If the vessel be made of copper, the weight and the size, "measured from lag to brim," being the diagonal from the top of the rim to the bottom edge, are generally dependant on the quantity of fluid required; thus:



100	10	100	10	100	10	100	10
1	9.7	15	14	21.0	20.5	31	30.7
2	1.9	1.1	1	21.50	21	30	29.8
3	1.00	1.0	12	22.0	21.5	36	35.90
4	15.0	1	18	22.5	22	43	41.00
5	1.75	1.5	14	23.0	22.5	48	46.10
6	12.5	1	20	23.5	23	54	52.20
7	18.5	1.1	21	24.0	23.5	58	56.30
8	1.00	1.0	22	24.5	24	63	61.40
9	1.12	1.15	24	25.0	24.5	67	65.50
10	21.00	1.0	24	25.50	25	71	69.60
11	21.00	1.05	25	26.0	25.5	74	72.70
12	22.5	1.15	26	26.5	26	78	76.80
13	23.50	1.2	27	27.0	26.5	81	79.90
14	23.25	1.25	28	27.5	27	85	84.00

A good illustration of a brewing copper with its adjuncts, including the method of smoke consumption employed by Meux and Co., 1803, is given in Thomson, *Treatise on Brewing*, 8vo., Edinburgh, 1849, p. 126, pl. 5 and 6.

COPPERAS, or green vitriol in its pure state, is a proto-sulphate of iron. It forms the base of the colouring matter for brickwork.

COPPI (ELIA) is said to have been the architect who designed, 1294, the church of S. Francesco at Pistoia, which remains unaltered; WEBB, *Sketches*, 8vo., London, 1848, p. 392.

COPTOS. The ancient name of the place now called Kopt, Koft, or Keft, situated a little below Thebes on the Nile. It was destroyed by Diocletian about 292. The *Description de l'Egypte* (texte) iii, 409-16, mentions the existence of the ruins of two temples, one having columns 5 ft. 3 ins. in diameter, and of a Christian church containing some remains of columns having a sort of Corinthian capital, with near them a triglyphed frieze carrying bulls' heads in part of the metopes; some details are given in the plates (*Antiquités*) iv, 1. The fragments show the names of Thothmos III, Tiberius, Caligula, and Titus. WILKINSON, *Modern Egypt*, ii, 129, also mentions portions of an enclosing wall 12 ft. thick, of brickwork with towers, especially at the eastern gateway. He specifies a small temple of Roman times with the name of Tiberius, at the village of el Kala; the *Description* names a small astylar temple at the village of el Kymâu, and to the S.S.E. of the town a road with two bridges.

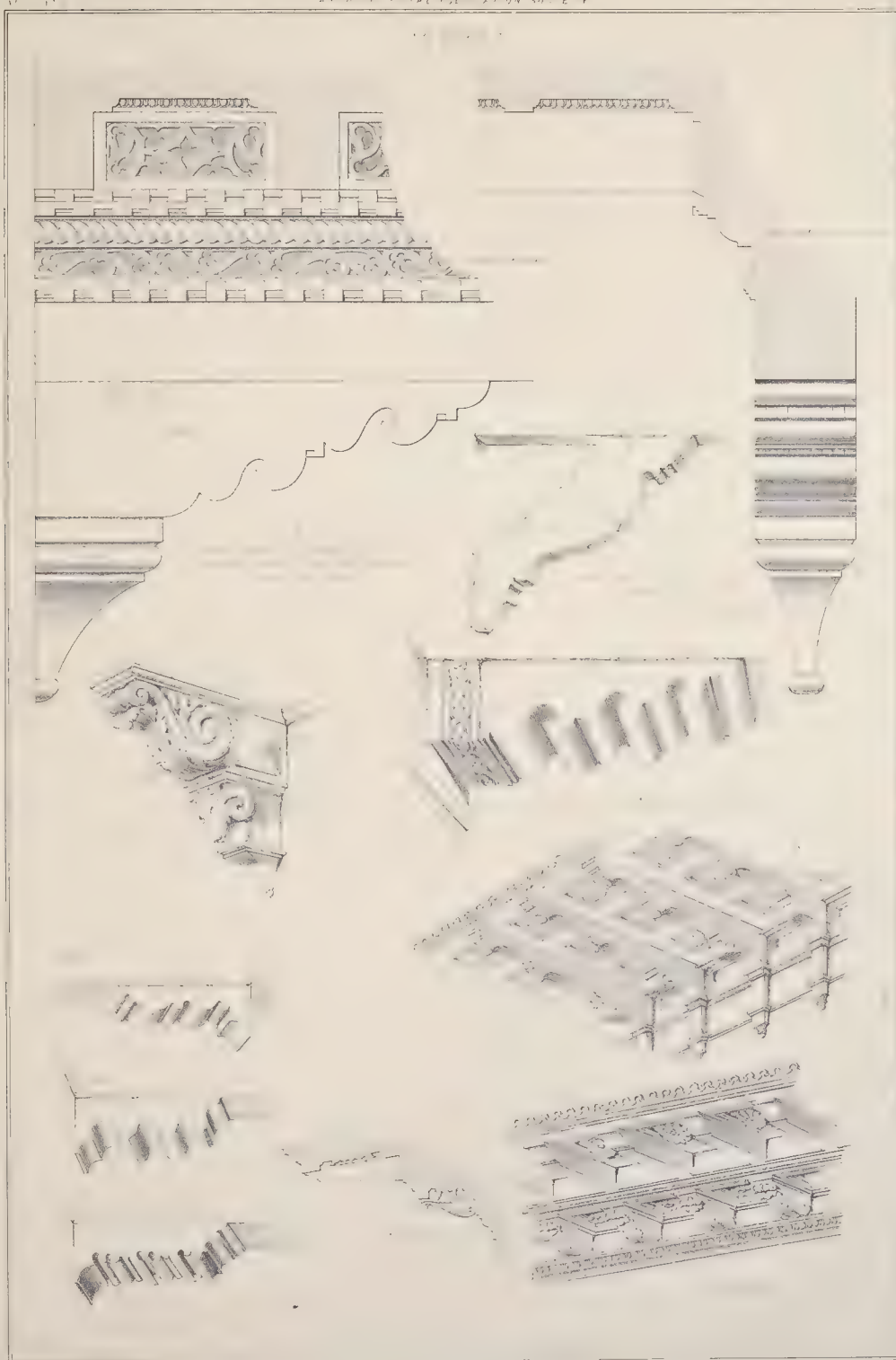
COPYHOLD. A copyhold estate may be described to be a parcel of the demesnes of a manor held at the will of the lord, according to the custom of the manor, by a grant from the lord, and an admittance of the tenant entered on the rolls of the court. There is also a species of copyhold held not at the will of the lord, but according to the custom of the manor, called a free copyhold or customary freehold, being indeed only a superior species of copyhold; there is besides another tenure, very much of the same nature, called ancient demesne, which prevails in some very few places in the kingdom. Copyhold estates granted in fee are known as copyholds of inheritance, and those for one, two, or three lives, are copyholds for lives, which it is sometimes the custom to renew; in other manors it is the custom to grant for years renewable on payment of a fine certain by any person entitled to the term. PETERSDORF, *Abridgment*, 8vo., London, 1827; the *Enfranchisement Acts* are 1 Vict., c. 26; 1 and 2 V., c. 110; 4 and 5 V., c. 35; 6 and 7 V., c. 23; and 7 and 8 V., c. 55; CASWILL, *Law of Copyhold and Enfranchisement*, etc., 3rd edit., 12mo., 1849; DEAN, *Compulsory Enfranchisement, etc., of Copyhold Property considered*, 8vo., London, 1851; FISHER, *Copyhold Tenure*, etc., 8vo., London, 1794; GOODWIN, *Copyhold Enfranchisement Acts, with forms framed by authority*, etc., 12mo., London, 1843; SCRATCHLEY, *Enfranchisement and Improvement*, etc., 8vo., London, 1854; SCRIVEN, *Copyhold, etc., Tenure*, 4th ed., by H. Stalman, 8vo., London, 1846; SHELFORD, *Law of Copyholds*, etc., 12mo., London, 1853; GILBERT, *The Law of Tenure*, 4th edit., by C. Watkins, 8vo., 1796; NORDEN, *The Surveyors' Dialogue*, 8vo., 1618, 3rd edit., and reprinted in *Detached Essays*, book ii.

CORA, now represented by Cori, a town situated about nine miles south of Velletri, in the delegation of Frosinone, in

the Papal States. Portions yet remain of three circuits of walls, built with polygonal blocks in as many distinct varieties of construction, though others appear to date between the years 100 and 80 B.C. Views of them and of a single-arched bridge, sometimes dated B.C. 450-350, built with masses of tufa, are given in DODWELL, *Cyclopiæ, etc., Remains*, fol., London, 1834, pl. 88-91. On the highest part of the inmost enclosure stands the remarkable tetrastyle portico, with two columns on each flank between it and the antæ of the cella to a temple, generally said to date in the century before the Christian era, and given in ANTONELLI, *L'ordine Dorico*, fol., Rome, 1785. The columns, of the Doric order, having a torus as a base, are polygonal for one-third of their height (VITRUVIUS ii, 3), the rest being fluted with arrises; they are quite eight diameters in height; the intercolumniations in front, which are equal spaces, are fully two diameters in width, those on the flanks being rather narrower; but in the front each intercolumniation has four metopes, while on the right flank there are five. The pilasters of the cella are of less diameter than the columns, and had a different capital. The doorway has inclined jambs, and its cornice rises to the soffit of the great architrave. This building, usually known as the temple of Hercules, partly serves as a vestibule to the adjoining church of S. Pietro; QUATREMÈRE DE QUINCY, *Diet.*, s. v., suggests that it exhibits the Vitruvian Tuscan order. Professor DONALDSON has noticed that "this example has many features in common with the Greek Doric: the flatness of the fluting, the absence of neck molding to the capital, the flat form of the whole capital, the angular triglyphs, the mutules over the metopes, all indicating a very early period of Roman art."

Lower down the hill, and in the strada S. Salvatore, is a house built between two columns of a Corinthian order, which have belonged to a temple of Castor and Pollux in the best period of Roman art. They are of travertine and, like those above named, appear to have been covered with a stucco. PIRANESI, *Antichità di Cora*, fol., Rome, 28.

CORA or CORE (Gr. κόρη, a maiden). The term CARYATIDE being only properly applied to the sculptured representation of a Caryan female slave, used instead of a pillar as the support of an entablature; any other variety of such a class of decoration becomes comprised under the term "cora," which is the general name employed in the celebrated inscription relating to the Erechtheum at Athens, to denote the six female statues employed in the *prostasis* of that edifice. The best-known varieties of this class of decoration are named according to the peculiar accompaniment of the cora when represented as a bearer (Gr. φέρω) of the *κάνεον* (canistrum or canum, FESTUS, s. v.) or flat wicker basket for the cake, chaplet, knife, and incense; the *κίστη* or deep basket for flowers; the *παστός* or shrine, the *ὕδρια* or vase, and probably other utensils also, in the festivals of Athena, Bacchus, Demeter, etc. Among the most remarkable existing antique pillar-statues of this sort are the six engraved by PIRANESI, *Vasi Antichi*, fol., Rome, 1778: one of them, not belonging to the others, was then in the palazzo Mattei all'Olmo: two were found, 1585-90, in a vigna Strozzi, about half a mile beyond the tomb of Cæcilia Metella, on the Appian Way, and were taken to the villa Montalto, whence one has been removed to the British Museum, where it is called a *canephora*, while the cistus is termed a *modius*, in the authorized Synopsis (1856) and in COMBE, *Description*, 4to., London, 1812, i. pl. 4. The other three were discovered on the same site, 1765 (one has the cistus inscribed with the names of the Athenian sculptors, Kriton and Nikolaos), and are now in the villa Albani; so also are four others, found 1761, in a vigna between Frascati and Monte Porzio, with a statue (of Bacchus?) inscribed Sardanapallos; CAVACEPPI, *Raccolta*, fol., Rome, 1768, iii. 28, has engraved one which has the hands up to the basket; perhaps that, resembling it, in the Dresden museum, belonged to the same set. There is also a cora, restored by Thorwaldsen, in the Vatican; its companion is in the palazzo Giustiniani; of those at the Erechtheum at







## CORBEL

Fig 1

FLORENCE  
BEHIND OR SANMICHELE

Fig 2

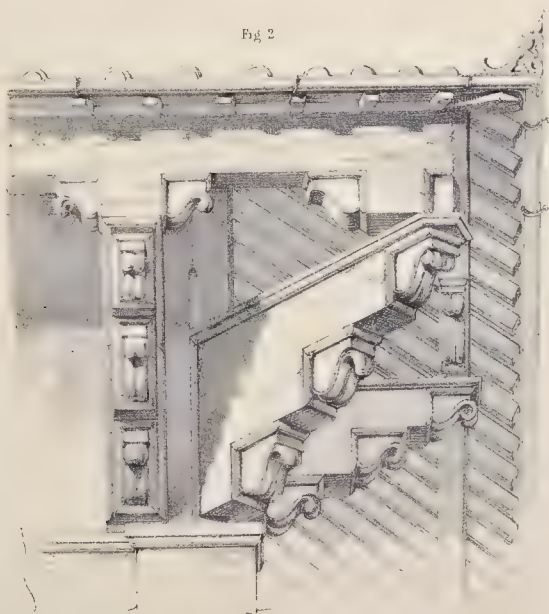
FLORENCE  
Piazza del Duomo

Fig 3

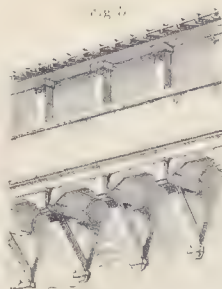
LYON  
LOGGIA

Fig 4

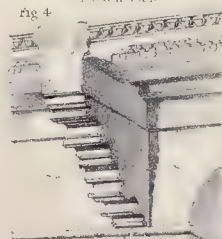
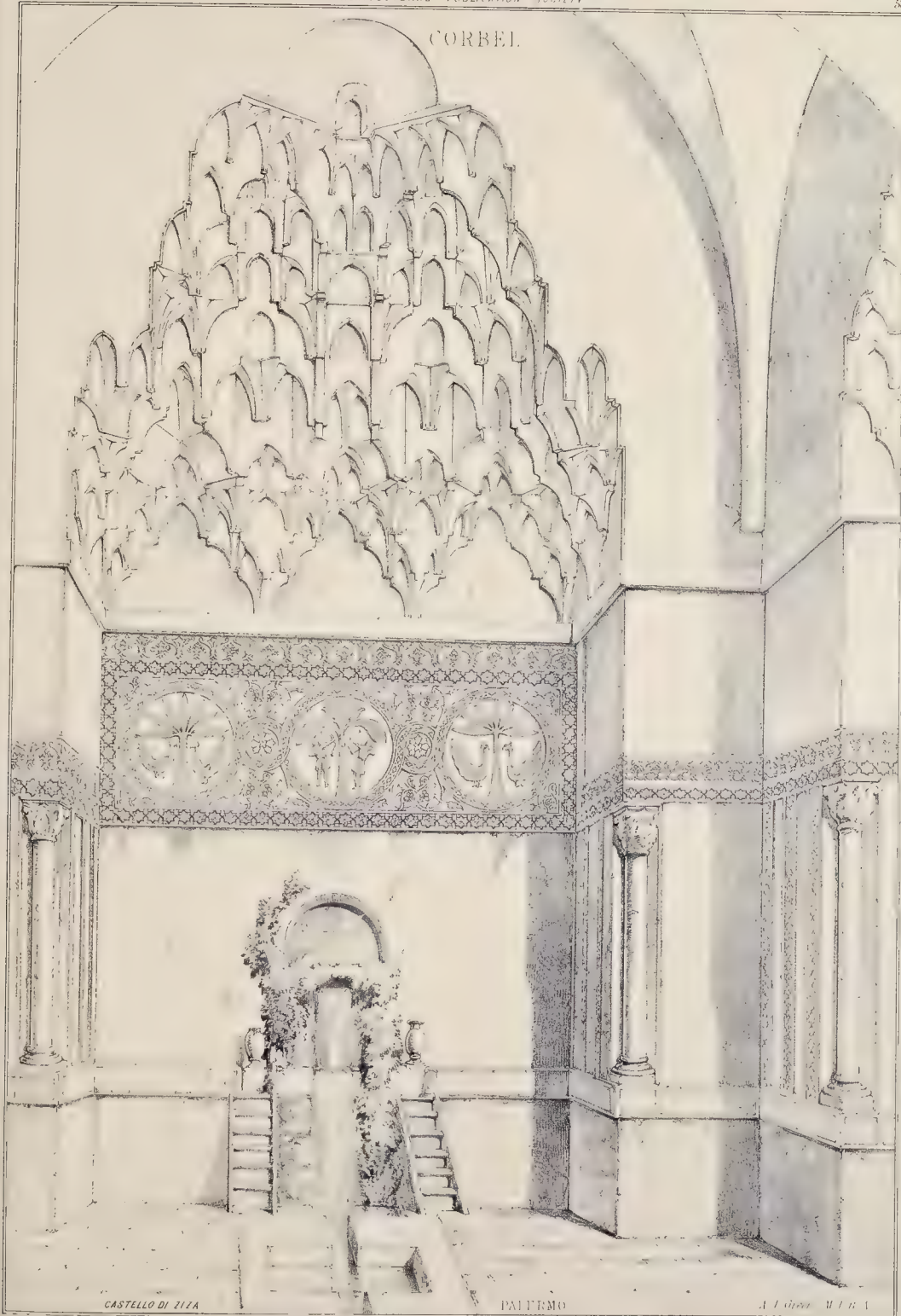
LYON  
STAIRCASE

Fig 5. Sydney Smith M.I.B.A.



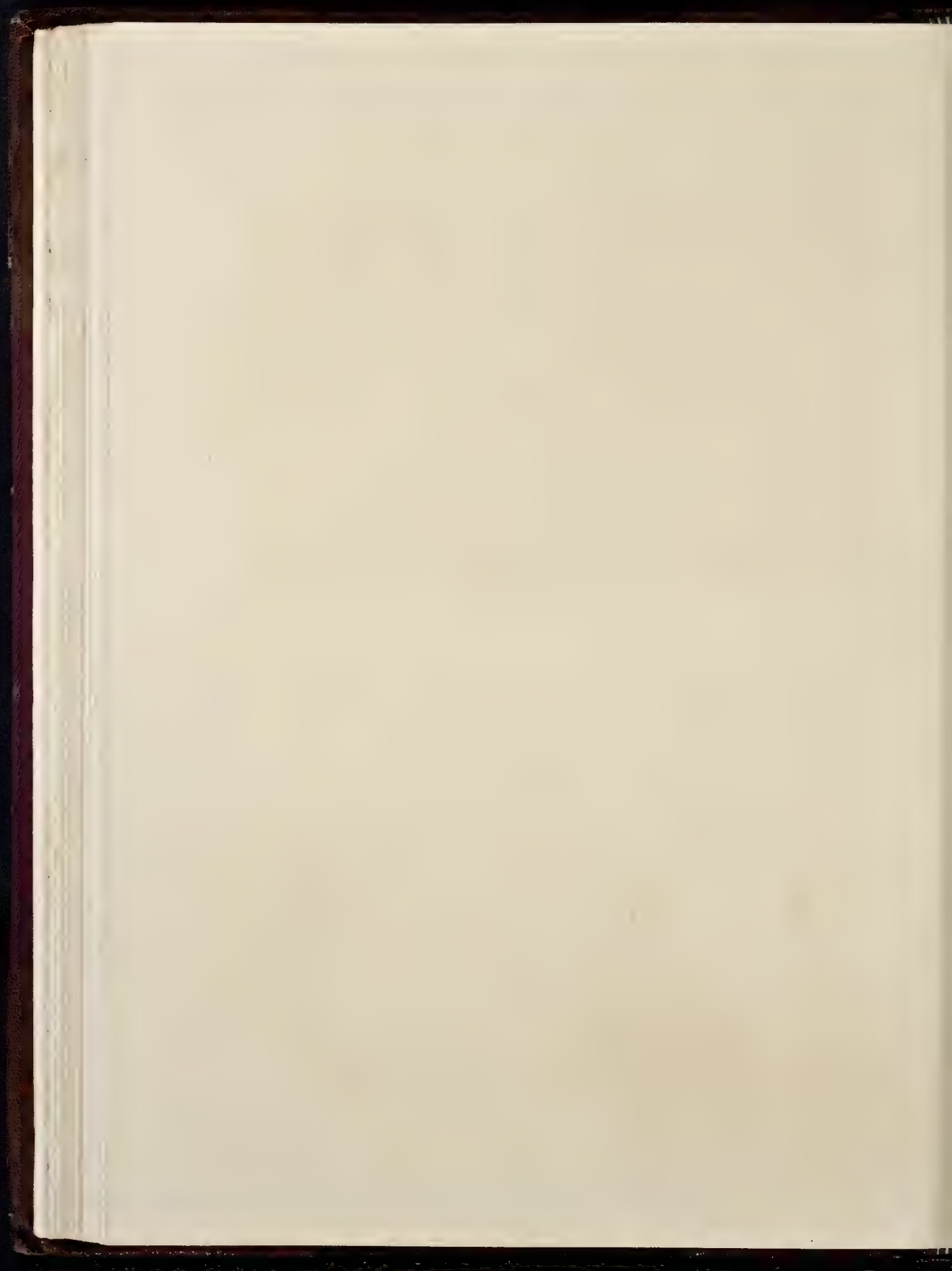


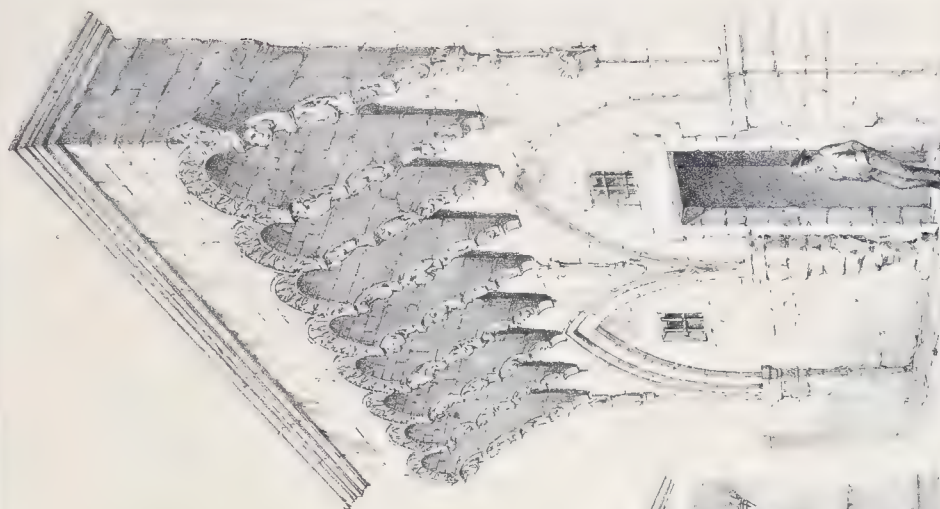
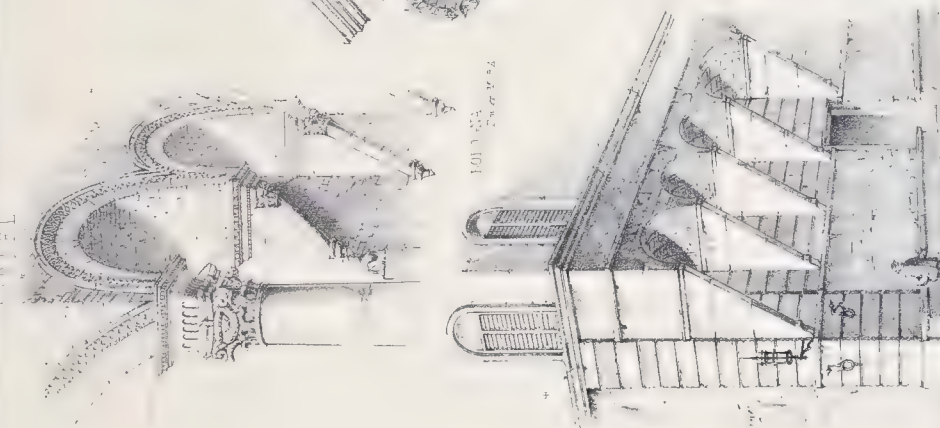
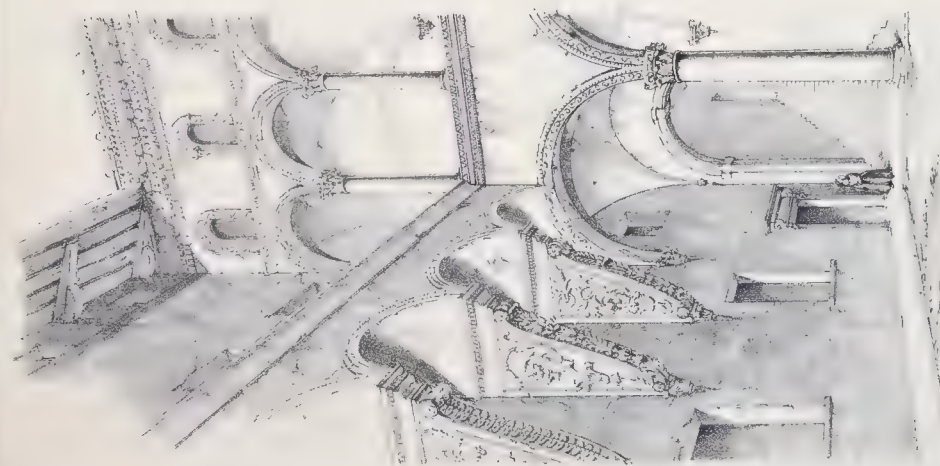
## CORBEL.



Lithographed by Messrs. Day & Son. New York 24<sup>th</sup> 1851











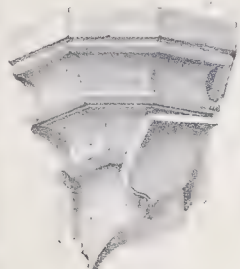
CORBEL.



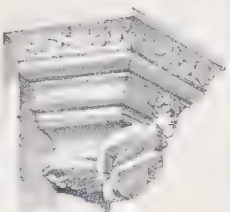
Stalls, Cathedral, AMIENS



Church at VAILLÉ, near CAEN



S. Laurence, NUREMBERG  
W. Burgess



W. Burgess



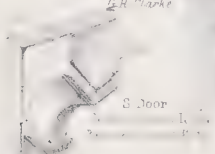
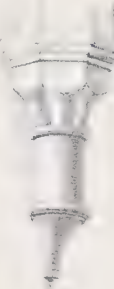
Chapel of S. Gildard, in Veste



Chapel of S. Gildard, in Veste  
R. H. Clarke



MA. VERN ABBEY  
O. H. Clarke



MA. VERN ABBEY  
O. H. Clarke



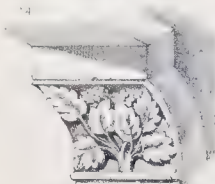
Priory, Little Wenhams, SUFFOLK R. H. Shaw



Priory, Little Wenhams, SUFFOLK  
R. H. Shaw

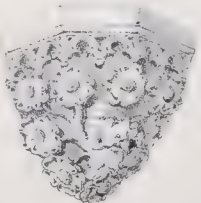
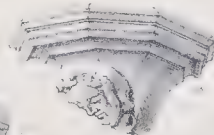


S. Francesco, ASSISI  
Fowler, M.B.A.



S. Francesco, ASSISI  
Fowler, M.B.A.

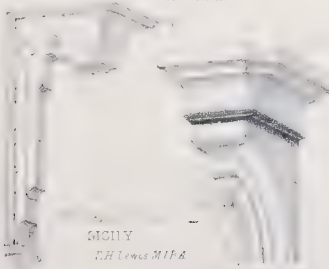
S. Laurence, NUREMBERG  
W. Burgess



Transsept  
BRICKINGHAM



MOULY  
F. H. Lewis, M.B.A.



Town Hall, DAMME  
W. Burgess





Athens one has disappeared, and another was deposited in 1801 in the British Museum; WILKINS, *Prousiones*, 4to., London, 1827, pp. 63-5, has given a restoration of this figure as carrying vases; but the imitations of it at the new church of S. Pancras in London, represent female figures with a vase in one hand and an inverted torch in the other. A remarkable statue of a cora found at Loukou is engraved in BLOUET, *Exped. Scient. de Morée*, fol., Paris, 1836, i., 3; iii., 56, pl. 88.

A singular, perhaps unique, mediæval instance of a female pillar statue at the abbaye de Tournous is given in NODIER and TAYLOR, *Voy. Pitt.* (Franche Comté), fol., Paris, 1825, pl. 21, and this feature of architectural decoration was not forgotten in the period of the *style de la Renaissance*; the four cistophoræ to the tomb of Louis de Brezé, grand seneschal of Normandy, are given in JOLIMONT, *Monumens*, fol., Paris, 1822; in NODIER and TAYLOR (Normandie), fol., Paris, 1820, i., 134; and in MULLER, *Sketches*, fol., London, 1841; figures, and terminal-figures, of both sexes, used either engaged in, or advanced from, the work which they seem to support, have been engraved in the illustrations of decoration and furniture at Fontainebleau and elsewhere, by MULLER; SOMMERARD, *Les Arts*; and BALTARD, *Paris*, fol., Paris, 1802, who also, pl. 27-8, gives the four statues of Jean Goujon under the tribune in the salle des gardes at the Louvre. Statues of coræ were also employed by Cagnola at the entrance portico of his own mansion at Inverigo.

CORALINE BRECCIA, also called SERANCOLINE BRECCIA (Fr. *brèche coralline* or *Serancolin*). A breccia which has some spots of coralline-red colour; BLONDEL, *Cours*, 8vo., Paris, 1771, v. 163-4. SERANCOLINE MARBLE. 25.

CORAL WOOD, see RED WOOD.

CORAZZI (ANTONIO), of Florence, erected a theatre in that city. He held, 1826, the title of royal Polish general-architect at Warsaw, where he built, 1822-23, the academy of sciences, having a façade of columns and pilasters on a basement of thirteen arcades; and the hôtel of the minister of Finance, having a hexastyle portico of the Corinthian order on a basement; the Ionic colonnade forming the wings, were added by Spilefski. 14. 68.

CORBEILLE. A French word adopted during the last century in the English language, for the CALATHUS or CISTUS, or basket, used in some designs for capitals of the Corinthian and Composite orders. The same name is also given to the different sorts of baskets carried by a female statue (CORA), or serving as other architectural decoration; whence the term has not only been applied to any vase having the shape and imitation of a basket, but to several Byzantine and mediæval capitals in which an effect of wicker work is introduced. 6.

CORBEL, CORBELI, and CORBYL (late Latin *corbeyus*; It. *mensola*; Sp. *canecillo*; Fr. *corbeau*; Ger. *kragstein*). The mediæval name for a stone projecting out of a wall to support or to appear to support some portion of work, either structural or ornamental. This term has been applied to brickwork and metalwork equally with masonry, but a timber corbel is sometimes called a TASSEL. If a corbel projects about double its height or more it is styled a CANTILEVER, as when employed to support the corona of a cornice, the eaves of a roof, the landing of a balcony, etc. If the projection be about equal to the depth, it is called a block corbel, or block simply; BLOCK CORNICE. A corbel that projects about half its height or less is termed a CONSOLE. A compound corbel formed by the junction of a console with a cantilever or other corbel, is usually known as a TRUSS; and this last term is very useful as affording a name for any sort of ornamental corbel that is very large in size, as there is generally some adjunct required to reconcile the corbel, that is the foundation of the design, with the moldings, etc., to which it belongs. The appearance of a corbel is frequently obtained in metal, wood, plaster, etc., and if this apparent corbel is known to be only fastened against a wall or other upright surface, it is properly termed a BRACKET, although

ARCH. PUB. SOC.

imitating a block, a cantilever, a console, or a truss, according to its proportions and composition whatever may be the material employed; there are however instances where, if of timber, they are called SHOULDER PIECES, and others where, if of metal, they are called STAYS or angle stays. The French writers upon architecture, by calling a mutule *console plate*, appear to hold the doctrine that a cantilever, if plain, should be called a corbel, but that if decorated it becomes a console; BOLSTER; SOURCE or SOUSE. The explanations given by RICKMAN, *Attempt*, 8vo., London, 1848, p. 12, appear to be incorrect; and BRITTON, *Dict.*, s. v., asserting that corbel has been used to signify a niche or recess in a wall, repeats the explanation, s. v. CORBERT and CORBERT.

Curious examples are indicated as having existed on the frieze of the doorway to the treasury of Atreus at Mycenæ, by INWOOD, *Erechtheion*, fol., London, 1827, p. 39; corbels, or *culs-de-lampe*, are also shown under the lintel of the north-west gate at Assos; and Indian examples are given on many of the pages of KITTOE, *Illustrations*, fol., Calcutta, 1838; FERGUSSON, *Illustrations*, fol., London, 1845, and his *Picturesque Illustrations*, fol., London, 1848. It is remarkable that RUGGERI, *Scelta*, fol., Florence, 1755, i. 16, intimates that the palazzo Ricardi at Florence exhibits, in its lower windows, designed by M. A. Buonarroti, the earliest examples of window-cills supported upon corbels in that city. BALCONY.

Several plates of the *Illustrations* exhibit the use of the corbel in many arrangements; pl. 53 shows the Moorish system of corbelling for projections; and throughout a great number of the other plates there will be found instances of the infinite variety of its application.

CORBEL MOULD. The term employed by PUGIN, *The true Principles*, 4to., London, 1841, p. 17, for a profile that would serve for work that would be corbelled out: it may be noted that this writer objected in such cases to throated, etc., soffits, deep hollows, and unnecessary nosings.

CORBEL'S MASTIC. The name under which a cement was very popular about the year 1777 at Paris: it appears to have had white lead for its base, and to have been used for filling and pointing the joints of the stone pavements of terraces, etc. BLONDEL, *Cours*, 8vo., Paris, 1771, vi. 138.

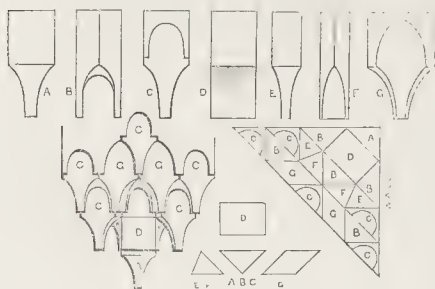
CORBEL TABLE. A term in mediæval architecture applied to a string course including its carriage by a range of corbels. Sometimes the corbels are connected by flat or angular work to the spaces between them, as at Ilffley; at others by semicircular arches, as at Peterborough, Southwell, etc. In the Lancet period the arches are usually pointed and trefoiled, the corbels are more sculptured, and if there be no arches above them they frequently carry a series of horizontal moldings which are still called the corbel-table. In later styles the corbels are represented by flowers, masks, etc., in the hollow of the cornice, *i. e.*, amongst the moldings of the tabling, and do not appear to support it. 16. 17.

CORBEL WORK OF CEILINGS. The appropriate name distinguishing the peculiarity of some moresque ceilings, like that at la Ziza (*Illustrations*, Corbel, pl. 53), which depends, like others explained by OWEN JONES, *Plans*, etc., of the *Alhambra*, fol., London, 1842, for its decoration wholly upon the corbels, placed beside and upon each other, which form the real construction of the ceiling, although only fastened together at the back by plaster strengthened by long reeds. The very rich ceiling of the capella Palatina at Palermo is illustrated in detail by GAILHABAUD, *Mons.*, iii.

These illustrations, taken from JONES, *Alhambra*, pl. 10, exhibit the seven different forms of corbels, all of one height, and proceeding, A, B, C, from a right angled triangle, with a base equal to that of a parallelogram, which is the foundation of D. The other sides of these plans are a standard for the equal sides of the isosceles triangle with the apex of 45°, on which is founded the figures E, F, and G. The curves are all similar, so that any piece may be combined with any one of



the others by either of its sides. There is also a plan of a pendentive thus made, with its elevation on a larger scale.



**CORBETTA** (ANTONIO MARIA), was appointed, 20 Feb. 1606, one of the architects to the duomo at Milan; he resigned 31 August, 1609. 27.

**CORBIE** (PIERRE DE) is styled by VIOLET LE DUC, *Dict.*, s. v. Architecte, 111, a celebrated architect of the thirteenth century, builder of several churches in Picardy, and perhaps the designer of the absidal chapels of the cathedral at Rheims.

**CORBIE-STEP**, see **CROW-STEP**.

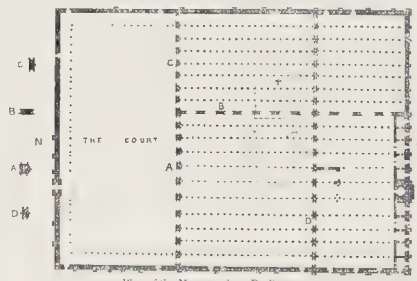
**CORCELLE** or **CORCELLES** (....), designed at Bordeaux, 1810-12, the synagogue which served as the model for that at Paris; and, 1830-5, that one of the Calvinist churches which has four Ionic columns in front. He died 1843-4. **BERNADAU**, *Biographie*, 8vo., Bordeaux, 1844, p. 183.

**CORDELIER BUILDINGS**, see **FRANCISCAN BUILDINGS**.

**CORDIA GERASCANTHUS**, Spanish elm, called also princewood, obtained from Jamaica, is used for turnery and by cabinet makers. It is called *sepe* in Trinidad, where it is a light-coloured wood, resembling English elm, and is much valued. Being impregnated with a bitter principle, it is preserved from the attacks of insects. The diameter varies from 12 to 24 ins. In Cuba it is called *baria*. Another species is sent from Jamaica, in logs from 4 to 7 ins. in diameter and from 4 to 5 ft. long. This is light-veined, and something like West Indian satinwood, but of a browner cast; the sapwood resembling dark birch wood; and this sort is chiefly used by turners. 71.

**CORDOBA** or **CORDOVA**. The capital of the province of Andalusia, in Spain. The city is of a rectangular form, divided by a wall from north to south, the western half was the original *villa* of the Roman Colonia Patricia Corduba. The walls, having thirteen gates, are flanked with towers of various dates; the octagonal one called *Malamuerte* being so late as 1406-8; one of the gates, called the *Puente*, 1571, said to have been designed by Juan Herrera, is arched and has four columns of the Doric order. The narrow and dirty streets are lined by large and commodious houses, consisting of two stories, with a spacious fountain-court, frequently entered by a porch of marble columns. The square is the *plaza Corredera*, now *de la Constitucion*, 268 ft. long by 100 ft. wide, with uniform houses on a regular plan, which are supported on fifty-nine arcades and have three rows of wooden balconies: these were used by the spectators of the bull-fights that now take place in the new arena called *paseo del gran capitán*: the *calle de la Feria* is a picturesque street, and in the *plazuela S. Nicolas* is a Moorish house. The Roman bridge, given in MURPHY, *Arabian Antiquities*, fol., London, 1813, as 1000 ft. long and 22 ft. 6 ins. wide within the parapets, had the sixteen semicircular arches rebuilt 719-23, and restored 796-822. The aqueduct was destroyed to build the monastery of S. Jeronimo, and an amphitheatre discovered 1730, was reinterred. There are few other antique remains, and none of the palace Rusahfah built 756, nor of the wonderful palace Zahra erected at five miles from the town, 936, and both destroyed 18th February 1008-9.

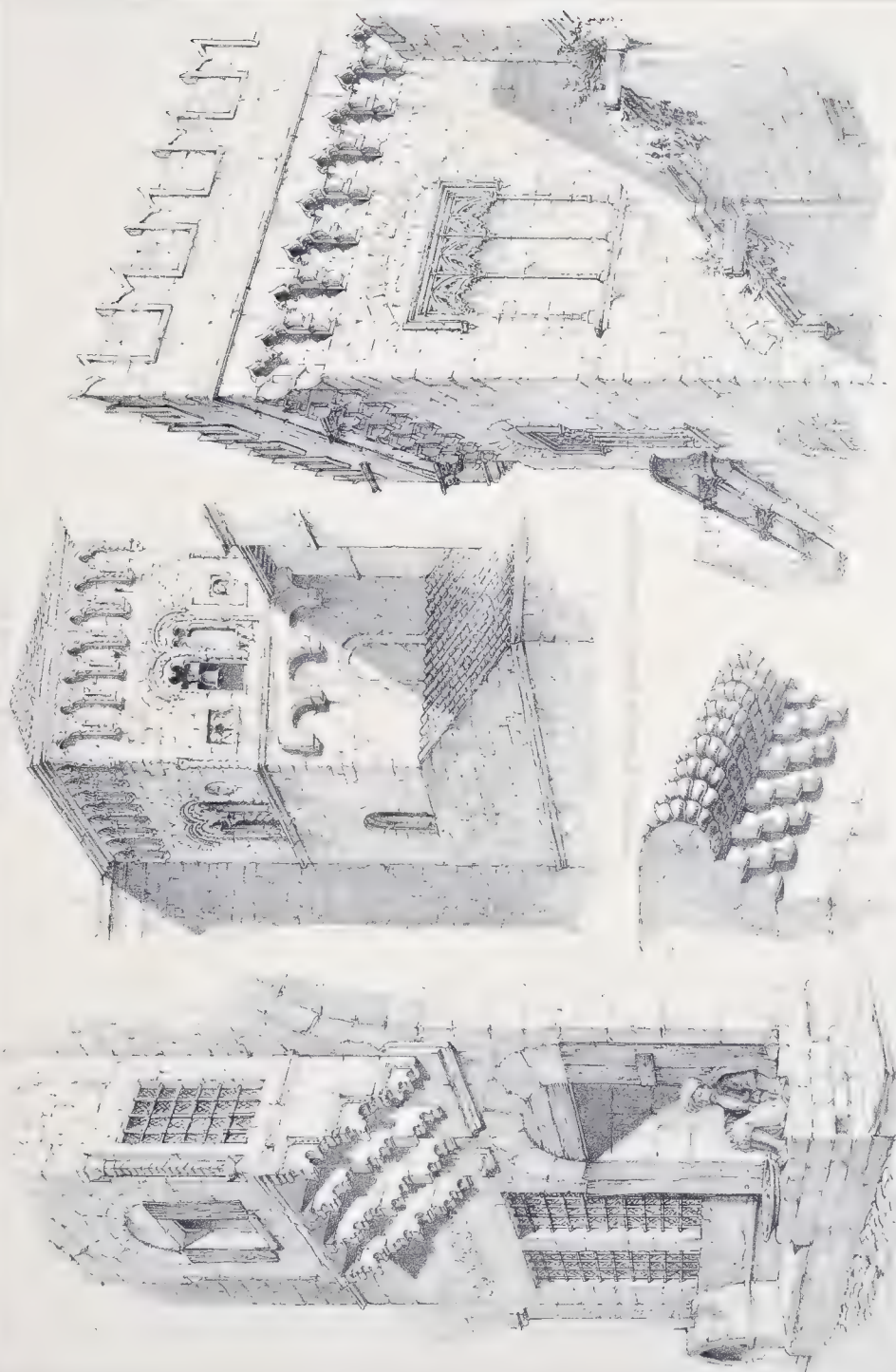
The cathedral dedicated to the Assumption and S. Raphael, occupies, with alterations, the celebrated mosque, which itself replaced a cathedral. The plan is taken from GIRAULT DE PRANGEY, *Arch. des Arabes*, (Atlas) fol., Paris, 1839-41; the building is also engraved in the *Antiguedades Arabes*, published by the Royal Academy, fol., Madrid, 1780; in LABORDE, *Voy. Pitt.*, fol., Paris, 1807; and in MURPHY; all expensive works, and which do not always agree with each other, or even have plates consistent with their text. The edifice is also described at length by GIRAULT DE PRANGEY, *Essai*, 8vo., Paris, 1841;



Plan of the Mosque, from De Prangey.

who explains that the mosque originally formed the part containing the great nave running south from the entrance to the *maksourah* and *mihrah*, with its five aisles on either side, each about 300 ft. long in thirty-three bays, about 10 ft. wide from centre to centre, and 30 ft. high, and covered by its own roof, showing in the interior, panels of carved and painted work, formed of the wood called *alerce* (CALLITRIS; THUJA). This portion, cleaned and restored in 1816 by Patricio Funiel, was commenced for Abdelrahman I, 786; the fountain in the courtyard, called the *patio de los Naranjos*, was designed 957-8, according to an inscription, by the architect, Said ben Ayoub. Great additions were made about 900, including the magnificent decoration of the seven-sided *mihrah* or holy niche (15 ft. diameter, covered by a monolithic roof, and called the *capilla de S. Pedro*, or *del Zancarron*), and the *maksourah*; both described at great length by GIRAULT, pp. 43-50, with illustrations. It is known that repairs were made 981, by the architect Abdallah ben Said; and other repairs with additions greater than the first-named, were made 988. It is therefore concluded that this must be the date of the erection, in thirty months, of the eight eastern aisles, each about 325 ft. long, in thirty-five bays, also about 10 ft. wide, and like the others these bays have upper and lower arches. The many similar names of the monarchs have much embarrassed translators of the chronicles; it was *one* of the Hakems, probably the earliest, 796-822, who added the *patio* or atrium; in it, in 1767, was found a tank 40 ft. square, in nine bays, with 6½ ft. between the soffit of the vaults and the pavement of the court. MURPHY gives 408 ft. long by 569 ft. wide as the size of the whole mosque; to which length is added 200 ft. for the width of the *patio*; these dimensions being to the outside of the walls, and not including the buttresses. Others say 440, 620 and 210 (Castilian) feet respectively. The external walls of the mosque have battlements (ALMENA); the gutters between the roofs were of lead as thick as a finger, and wide enough for two persons; these were supported on walls 4 ft. 6 in. thick, standing on arches, and columns 18 ins. in diameter, which with those in the cloister of the *patio*, must have been about 1000 in number.

Some of the perforated marble slabs still remain in the windows. Two doorways were reserved for the access of females to the galleries, and one doorway on the south communicated with the *sabath* or subterranean passage to the palace. The *capilla de Villa-Viciosa* (near the southwest corner of the dotted rectangle) was raised about 10 ft. from the ground in the centre of the first mosque; it was a throne for the caliph on the east,







(if that was not in a southern chapel), and for the doctors of the law on the west. GIRAULT, pp. 71-7, deems it an instance of the transition in the eleventh or twelfth century, from the Cordovese to the Granadine style of moresque art. GAILHARBAUD, *Mons.*, etc., iii, gives several illustrations.

The modern history of the cathedral dates less from 1263, when the city was regained by the Christians (the *mimber* was converted into the sacristy 1257-74), than from 1523, when Charles V gave permission for the pillars (included within the dotted rectangle) to be destroyed for the present choir, and an aisle of three bays in width was formed by walling between the columns on the north side of it to correspond with the moresque wall on the south side. This work was begun in a plateresque style by the architect Hernan Ruiz I, who was succeeded, 1547, as *maestro mayor* by his son Hernan Ruiz II, ob. 1583, who completed, 1571, the *capilla mayor*; the church was finished (it is presumed on the advice of Diego de Praves, *maestro mayor* of Valladolid, who was consulted 1597) by A. de Maeda 1593-9. The *custodia* is a fine work by Enrique de Arfe 1513-8, repaired 1753 and 1784. The *silleria*, or stall work, of mahogany, was begun 1748, by Pedro Duque Corneja, who died 1758 (aged 80), the year it was finished. The *retablo mayor* designed by the Jesuit Alonso Matias was finished, 1618-28, and his tabernacle for it was completed by Sebastian Vidal, 1653. The *capilla-real* was commenced 1607. The sacristy, or capilla del Cardinal Salazar, who died 1706, was the work of F. Hurtado Izquierdo 1700. MURPHY saw the original wooden roof above the plaster work of the modern arches or light vaulting in brickwork, sometimes called cupolas, introduced 1713-23, by Valle Ledesma. The *sala capitular*, commenced 1805, was stopped by the interference of the academy of S. Fernando. About 75 ft. of the tower of the mosque (standing on the west side of the gateway of the *patio*) taken down and rebuilt in thirteen months for Abdelrahman III, El-Nasr-Ledin-Allah, was retained by Hernan Ruiz I, who added about 90 ft. to it; it was still incomplete, when it was so much damaged, 1589, by a hurricane, that Fernan Ruiz III, made fresh designs, 1593-1604; the sixth story was finished, 1664, by Juan Francisco Hidalgo, successor to Gaspar de la Pena. The repairs necessitated, 1755, by an earthquake, were finished, 1763, by Luis de Aguilar; it is now 240 ft. high and 30 ft. square.

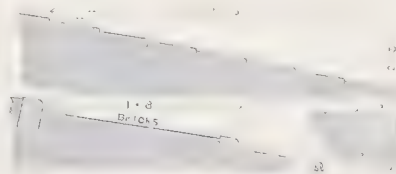
Besides this edifice the principal buildings are S. Hipólito founded 1348, and the parish churches of S. Pedro, an old basilica with an Italian façade added 1542; S. Lorenzo with a round window on the front and a good tower; Sta. Marina and S. Miguel; all these are called works of Pointed art. S. Nicolas de la Villa (with a high and curiously designed tower finished 1496), S. Nicolas de la Ajerquia rebuilt 1525-75, el Espiritu Santo 1570, and the chapel of the Jesuits' college built by A. Matias, and now called del Salvador y S. Domingo de Silos, are the chief of the other ten parish churches which have all been rebuilt. Of the nineteen former monasteries little remains of importance except the semi-Gothic church, a churriguesque façade, fine upper and lower cloisters, and a splendid staircase, of S. Pablo; the large handsome building of S. Pedro el Real, also called S. Francisco, now a cloth factory; and the church (lately repaired by the Commission, etc., of monuments to prevent its total ruin) of S. Agostino, dating 1575-1600. Six convents have been secularized; of the thirteen left those of Sta. Maria de Gracia with a good church, 1601, and Sta. Maria de las Dueñas, are the most interesting. There are also twenty-four chapels called *ermitas* and three *santuarios*, of which last, that dedicated to S. Rafael and called del Juramento has a fine church, 1796.

The interior of the episcopal palace is better than the outside, built 1745, when the old front, called *palacio viejo* was repaired and the rich staircase was constructed. The *hospital general*, or del Cardinal de Salazar, 1701-24, with seventeen wards and eleven courts, for one hundred persons, has for its chapel the

private mosque (976-1002) of Mahomed el Mansour the guardian of Haxem II. There are seven others, of which the best is the *hospicio*, or almshouse, for 160 persons, built 1577. Among the fifty-six schools, the leading architectural works are the *seminario conciliar* with a fine staircase and chapel; the *colegio de la Asuncion*; the *colegio de niñas* de Sta. Victoria with ten courts, and a rotunda for a chapel with sixteen columns of a Corinthian order, built by the French architect, Balthasar Drevetton, called also Grevetton; the cupola bulged, and was set right by Ventura Rodrigues, 1772, who designed the façade. The *alcázar viejo* has nearly disappeared; the *alcázar nuevo*, built 1312-50, formerly the office of the Inquisition and afterwards the prison, had its lower story converted into a stable for stallions by Juan de Minzares, 1584. The prison dates 1568-1603, and the *casa del ayuntamiento* was rebuilt 1734, when the fine marble staircase was added. Amongst the finest façades in the city are those of the *casa Paez*, the hospital S. Sebastian, the oratorio de S. Filipe Neri, and *la Cuadra* in the *plazuela* de S. Nicolas de la villa, which has a fine gallery; the theatre in the *calle del Corpus* was built 1799.

The fine cloister of the monastery of S. Geronimo is three miles, and the noble bridge of dark marble, built 1788-1808, at Alcolea, is six miles, from the town. CONDE, *Dominacion*, 4to., Madrid, 1820. 28. 85.

CORDONATA, SCALA CORDONATA, or SCALA A CORDONI. The Italian terms used in descriptions of edifices to indicate that arrangement of step-divisions in an inclined plane, these being intended for the use of animals; each step has not less than an inch rise, the surface of the tread, for surer footing, being thus made of less slope than the general incline. The treads are formed of brick or tile, the retaining band (It. *cordone*; Fr. *cordón*, *ourlet*) or rising edge of the step being formed of travertine or other stone. Such are the approaches to the principal vestibule or saloon in the villa di papa Giulio (LETAROUILLY, *Edifices de Rome Moderne*, Paris, 1825, pp. 446, 462, 489, pl. 205-8); to the roof of S. Peter's; to the Capitol; and other places at Rome: the illustration shows the construction of the approach to the palazzo di Podestà at Bologna. O. H.



CORDOVA or CORDOBA is also the name of two cities in South America. One is the capital of the province of the same name in the union of La Plata. The streets are well paved and clean, the houses well built, and the wide market place has some large and good buildings; the cathedral, dedicated to SS. Peter and Paul, four parish churches, three monasteries, two convents, and a *seminario*, tell of its Spanish architects. The other, in the state of Vera Cruz, in the Mexican Confederation, has broad and well paved streets lined by houses built of stone, and looks well even at a distance, on account of its domes, towers, and steeples: the large central *plaza* has arcades on three sides, a very handsome and richly decorated cathedral on the fourth, and a central fountain. 85.

CORE. The name given to small portions of siliceous matter imbedded in the pure or white chalk (the 'upper chalk'), which cannot be detected until after the chalk is burned for lime, and are then known either by their not passing the screen, or by not slaking: portions of the pure chalk itself are also rejected as core (Fr. *biscuit*), if they will not slake for want of sufficient burning. PASLEY, *Treatise on Limes*, etc., 8vo., London, 1847, p. 24, speaks of core, reduced to fine powder in grinding quick lime for concrete, as harmless, but this state-



ment is untenable. Such particles are liable to slake and burst the face of plaster work during its setting. The wooden, metal, brick, or stone pillar, covered by a case of any material, is also called a core; and the term is also applied to the filling, or centre portion of a wall executed with concrete or rubble work between brick or ashlar faces. The blocking out to form a cornice finished in cement or plaster is usually called a 'core' when executed in rubble stone or brick; but a 'cradle' when in wood. CORING.

CORE. In iron founding, when any casting is wanted to be hollow, the mould that gives the outside form encloses another, which is called the 'core', and this gives the inside shape to the casting, as the metal flows between the mould and the core. The cores are usually hollow, and made of wrought or cast iron, with an opening or holes running from one end to the other; this iron core is surrounded by hay bands, covered with a composition of cowdung and loam, turned to the shape, dried in a kiln, again turned to the exact size, and blackened with coal dust. The iron core is very often not concentric with the loam, or sags from being too thin for its length; in either case an unequal thickness of metal, in the casting, results, which is a fatal defect in hollow columns intended to bear weights. G. A.

CORFE or CORFE CASTLE MARBLE is a name given to a grey or Purbeck marble formerly quarried near the town of Corfe in Dorsetshire. TURNER, *Some Account*, 8vo., Oxford, 1851, preface, p. xxv, states that "in the twelfth and following century—the material used for finishing, and for the mullions of windows, is usually termed freestone, and was brought in all probability from Corfe."

CORFU. The capital of the island of the same name, and of the united states of the Ionian islands. The citadel, which contains the government house, arsenal, barracks, several chapels, and many houses, is almost a town, while the city itself is rather a highly fortified place with four gates. Its well paved and arcaded streets are generally formed by two storied houses with terrace roofs. The chief buildings are the magnificent cathedral, built 1670, and dedicated to S. James the Greater and S. Christopher; the palace of the senate; the sanctuary of S. Spiridion; the church of S. Nicolas, containing the tomb of the empress Theodora, transferred 1436 from Cyprus; and the lazaretto on the island of Vido. The only important antiquities are mentioned *s. v.* CADACHIO. 85.

CORIA. A city with large suburbs in the province of Estramadura in Spain. It is circular on plan, 1530 ft. in circuit, and separated from the suburbs by a stone wall 35 ft. high and 11 ft. thick, exhibiting many antique sculptures and inscriptions. This wall has towers and four gates, and is attached to a pentagonal castle of 165 ft. on each face, and 100 ft. high. The fairly paved and clean streets consist of two-storied houses. The principal building is the cathedral, dedicated to the Assumption of the Virgin; to the left of the west door is a tower 150 ft. high; the single nave, 145 ft. long, 46 ft. wide, and 80 ft. high, was restored and revaulted directly after the earthquake of 1750, the rest of the building dating 1108-1495; the excellent stall work or *silleria* was executed 1489. Another church; a synagogue, 1474; the episcopal residence; the hospital of S. Nicolas de Bari, 1515; the *casa consistorial*, ruined 1836; the public granary, serving instead of the ruined *casa del ayuntamiento*; the prison, 1686; a school for a hundred girls; the *seminario* chapel, 1834; the plateresque palace of the duke de Alba, marquis of Coria; and the nunnery of Sta. Isabel, are the other chief edifices. 85.

CORIA (JUAN DE) succeeded J. de Orca 1583 as *maestro mayor* of the works at the Alhambra, and was soon succeeded by J. de Minjares. 66.

CORIASSE (JACQUES), as *maître des œuvres de la ville de Paris*, superintended the operations of Domenico Bocador or Bocalor, called de Cortone, with Ercole or Nicole Siciliano, as architects and engineers, under whom the fossés of Paris were

made in 1536 for Francis I. SAUVAL, *Histoire*, fol., Paris, 1724, i, 43, 81.

CORING. The operation of clearing the flues of a newly built house of the rubbish which accumulates during the raising of the walls. J. M. L.

CORINTH. A celebrated Greek city situated on the north coast of the Peloponnesus. The mediæval town was destroyed in 1822; the modern city, intended to be rebuilt on a regular plan as the seat of a bishopric and of a district government, was in 1850 merely a straggling village called Ghiourdos or Gortho, although KEPPEL, *Journey*, 8vo., London, 1831, i, 10, speaks of a governor's house and some other public offices then being erected. Besides traces of the ancient walls and of Hadrian's aqueduct, the principal antique monuments are some columns at the southwest extremity of the village; ruins nearer the town, where LEAKE, *Travels in the Morea*, 8vo., London, 1830, iii, 246, found portions of flutes having a chord of at least 12 ins., so that their columns must have been at least 6 ft. 4 ins. in diameter, which he considers to have belonged to a temple to Apollo; a large mass of brickwork, perhaps part of thermæ; and a portion of a rock-cut amphitheatre, a cavea 100 ft. deep round an area 290 ft. long and 190 ft. wide, had a subterraneous entrance. At one of these two last-named structures were marks of cramps for fixing slabs (of marble?) as casing to the walls, according to CLARKE, *Travels*, 4to., London, 1814, part 2, ii, 730-60. The columns first named are supposed to have belonged to a temple to Athena Chalinitis; twelve were standing so late as 1785, as shewn in STUART and REVETT, *Antiquities*, fol., London, 1827, iii, 115, and other authorities. Only seven existed in 1795 and 1850, which are shewn in BLORET, *Expédition Scient.*, fol., Paris, 1836, iii, 35, pl. 76-80, five being on one face of the edifice, and two on the return. They are monolithic in the shaft, of fine limestone covered with stucco, being 5 ft. 10 ins. in diameter, and scarcely four diameters in height; hence they have been considered to exceed in age any existing remains of the Doric order in Greece; yet as the fluting has only been executed at the extremities of the shafts, it is presumed that the operation was in progress when the city was taken by the Romans, B.C. 146. The shafts have each twenty flutes that are segments of circles on plan; the guttæ are round and stand free from the architrave. The Acro Corinthus, the citadel, rises 1886 ft. above the level of the sea, and in 1850 was completely desolate: the poor cathedral, dedicated to S. Nikolaos, the churches, the mosques, and the houses, being a heap of ruins. An earthquake, February 1858, is said to have reduced the city to ruins. H. R. N.

In the isthmus of Corinth there are traces of an attempted canal and of a wall; as well as some portions of a theatre, of a stadium, and of Doric columns which had flutes 10½ ins. across at the bottom, according to LEAKE, p. 244, and which probably belonged to the sanctuary of Poseidon. WHEELER, *Journey*, fol., London, 1682, p. 439; ALDENHOVEN, *Itinéraire*, 8vo., Athens, 1841.

CORINTHIAN BRONZE (Lat. *as Corinthiacum*). The bronze most esteemed by the ancients. It is generally supposed to have been an alloy accidentally made by the fusion of various metals, especially gold and bronze, when Corinth was burnt by Lucius Mummius, B.C. 146, PLINY, *H. N.*, xxxiv, 2, who states that there were three classes; one to which a preponderance of silver imparted to the alloy a light colour; another in which gold gave a yellow tone; and a third which was composed of equal portions of the different metals. It appears certain, however, that several of the artists whose works are specified as being in Corinthian bronze, were dead long before the date above given; and FIORILLO, in the *Kunstblatt*, 1832, xcvi, contends that it was no composition of the precious metals, but perhaps an alteration of the usual proportions, 88 of copper to 12 of tin.

CORINTHIAN ORDER. The name applied to the most decorative of the three classic orders, and which bears a foliated

and voluted cap, deriving its name from the legend of its invention by Callimachus, given in VITRUVIUS. The bottom of the column has been amply illustrated *s. v.* BASE. The shaft, in the opinion of VITRUVIUS, iv, 1, "has the same proportions as that of the Ionic order except in the capital; the other members of the order, which come above the columns, are placed on the Corinthian according either to the Doric arrangements, or to the Ionic manner, because the Corinthian has had no regulation (proper to itself) of the cornice and other decorations: so that it either has mutules (regulated by triglyphs) in the cornice, and guttæ in the architrave arranged after the Doric fashion; or else (as he repeats iv, 2) it has a frieze accompanied by dentils and a cornice in the Ionic way: so that out of the two kinds, by the introduction of a capital, a third order is produced in building."

After giving the well known story of the origin of the capital, which is sufficient evidence of the desire felt by the Greeks to claim the invention, VITRUVIUS proceeds to give the rule for the formation of it, but, as illustrated *s. v.* CAULICULUS, no remnant of antiquity appears to coincide with the Vitruvian precept. He does not mention the truncated end of the horns of the abacus, and the practice was not followed in the Athenian stoa, nor at the temple to Vesta in Rome. Neither does he specify the foliage which is to be employed; that of the temple to Vesta at Tivoli is said to resemble the *verbascom sinuatum*, according to a note by H. N. HUMPHREYS, in *Rome*, etc., 4to., London, 1840, p. 76; and it is further remarkable that this capital, like another given by SALZENBERG, *Die Altchristliche Baudenkmale*, fol., Berlin, 1854, has the indentations and markings of the leaves incised in the solid bell, instead of appearing to be applied to it. The leaf employed in this order by the Romans is generally called the olive; the acanthus being used, it is supposed, in the Composite; and that DODWELL, *Classical*, etc., *Tour*, 4to., London, 1819, ii, 192, did not perceive the ACANTHUS growing in any part of the Isthmus of Corinth, might be considered a remarkable fact if the antiquary had not already been prepared to believe that the story of Callimachus was merely a fiction invented by the Greeks to conceal their adaptation of some of the Assyrian or Egyptian sculptured capitals: LAYARD, *Discoveries*, 8vo., London, 1853, p. 233, mentions and gives a very slight sketch of a slab which, when discovered at Koyunjik, was almost destroyed, but shewed representations of "columns, whose capitals were not unlike those of the Corinthian order." Callimachus, who lived before 396 B.C., may perhaps have adopted the acanthus as a decoration for plain bell-capitals such as are seen on a basso-relievo, in the villa Albani, of an archaic period; or from some of those statues of a CORA which were executed before B.C. 408. The few examples of foliated Greek capitals, sometimes called Corinthian, present a very characteristic difference to those of the Roman artists; the vigour and grandeur imparted to it by the latter are seen in many of the finest examples still existing in all parts of their dominions. The Roman capital generally consists of two ranges of conventionalized leaves, with four angular volutes and eight caulicoli, two in the centre of each face.

Examples of the use of the Doric entablature with the Corinthian capital are wanting; but the Ionic is used with this capital in the temple to Vesta near Tivoli, that to Antoninus and Faustina at Rome, in the portico of Octavia at Rome, in the arch of Hadrian at Athens, and in the temple at Euromus, now Jackly, near Mylassa. A good collection of antique examples (with entablatures unknown to VITRUVIUS) is given in MAUCH, *Neue Systemat. Darstellung*, 4to., Potsdam, 1845; and of modern ones in NORMAND, *Parallel*, fol., London, 1829. ATTICURGIO; ROMANESQUE.

CORIUM. A Latin term metaphorically given to a bed of mortar, and by analogy to a coat of plastering, in which sense it is used by VITRUVIUS, vii, 3, and to a course of stones, ii, 3 and 8.

CORK. A seaport city in, and the capital of, the county of Cork in Ireland. It is built on the river Lee, over which are

ARCH. PUB. SOC.

six bridges: S. Patrick's, 1791, of limestone ashlar hearted with rubble; the centre arch is 60 ft. span, and two side arches are each 50 ft. span: Northgate, 1712, by Coltsman, widened 1831, has three semicircular arches: Anglesey, 1831, by Griffiths, has two elliptic arches, and a central drawbridge of 32 ft. span opens by lifts for vessels; cost £7,500: Parliament, 1806, one arch of limestone, cost £4,000: Southgate, 1713, by Coltsman, has three semicircular arches; and Wandesfords, 1776, by Samuel Hobbs, has one large segmental arch of red clay slate rubble. The appearance of the city is cheerful and picturesque: the principal streets are spacious, well paved and lighted, while most of the houses are large and well built.

Though formerly rich in monastic foundations, their only remains are the tower of the Red abbey; and the lower story of the tower, and west doorway of the cathedral, dedicated to S. Finbar. This building, erected 1735, on the site of the former structure, has only a nave of small size; the tower is now surmounted by a bulbous octangular spire. The principal churches are, S. Ann's Shandon, 1722, with a square tower 160 ft. high; S. Mary's Shandon, 1693, the crypt has the property of preserving corpses a considerable time from decay: S. Peter's, 1788, having at the west end a square tower, with an octagonal lantern, and lofty spire, in the Third Pointed style: Christchurch, 1720, by Coltsman, internally remodelled in the Greek style by G. R. Pain 1828, who removed the tower: S. Paul's, 1723: S. Nicholas, rebuilt 1847 by Joseph Welland, in the First Pointed style, a cross church with aisles, which is of limestone and cost £6,800: and S. Luke's chapel, 1837, by G. R. Pain, in the Third Pointed style, also a cross church, with a tower and spire at the west end. The principal Roman Catholic church is S. Patrick's, 1836, by G. R. Pain, having a rich hexastyle Corinthian portico, a lantern of eight Corinthian columns supporting a circular stele, surrounded by figures of the twelve apostles, all executed in limestone: S. Mary's Dominican, 1833, by Kearnes Deane, is a cross church; the interior is of the Corinthian order; the exterior, yet unfinished, has a hexastyle Ionic portico: adjoining is the friary, Italian, 1849, by Wm. Atkins, having a lofty campanile, and is of red stone with limestone dressings: S. Mary's or the cathedral, 1808, a plain structure, had the interior remodelled in 1828, by G. R. Pain, who designed the elaborate ceiling in the Third Pointed style; Sir John Benson added in 1854-5 a lofty tower in the Second Pointed style, lengthened the nave in the same style, and inserted stone mullioned windows in the old portion, which is of red stone with limestone dressings: the Franciscan friary, 1830 (Italian), by Charles Cotterel, has a peristyle of eight Ionic columns; it is of limestone, and cost £4,500: the Capuchin, of the Holy Trinity, commenced 1832 by G. R. Pain, is still unfinished (Gothic); the building stands north and south, and the foundation, laid below the bed of the river, is on piles; the nave is 128 ft. long by 60 ft. wide; in front is the tower with an open-work spire 200 ft. high, not yet finished; it has cost £23,000: S. Vincent de Paul, 1853-6, by Sir John Benson, in the First Pointed style, consisting of a nave and aisles, a shallow chancel and sacristy, has cost £10,000; the altars, reredos, etc., were designed by Weightman, Hadfield, and Goldie, of Sheffield: four other churches are of no interest. The convent of the Sisters of Mercy, commenced 1850 by William Atkins, a fine building in the First Pointed style, is of red stone with limestone dressings, and has cost £7,000 (*BUILDER Journal*, viii, 582), the church not yet built. The Independent chapel, 1831, by G. R. and James Pain (Italian), is of grey limestone, 80 ft. by 40 ft., and cost £3,000. There are also eight other chapels belonging to other persuasions.

Queen's college, 1848, by Sir Thomas and Kearnes Deane, in the early Third Pointed style, is built of light grey limestone; it cost £35,000; the large quadrangle is 216 ft. by 161 ft., with an ambulatory on two sides (*BUILDER Journal*, vi, 631). The lunatic asylum, commenced 1849 by William Atkins, is an immense range, in the First Pointed style, of three



stories, accommodating about 450 patients; there are three ventilating towers; it is built of brown clay slate stone lined with brick, and limestone dressings, cost £87,000. The Athenæum, 1854, by Sir John Benson, has a semicircular colonnade of a Roman Doric order at the entrance, the hall is 150 ft. long by 50 ft. wide and 52 ft. high, of a fluted Corinthian order on pedestals; there is a continuous light on the top of the vaulted ceiling; and at the end is a rotunda 50 ft. in diameter, with a domed ceiling, lighted from the top; it is of Bath stone on a stylobate of rusticated limestone. The Royal Cork Institution, adjoining, has a library, museums of natural history and of antiquities, the latter containing a very valuable collection of casts, now appropriated to the use of the School of Design.

The county and city courts, 1835, by Messrs. Pain, occupy an area 280 ft. wide by 190 ft. deep; the principal front has a boldly projecting octastyle Corinthian portico, the courts are semicircular on plan, lighted from the top, and are unsatisfactory as regards hearing and ventilation; the cost was £22,000, the material limestone: the county gaol, 1818, by Messrs. Pain, has a tetrastyle Doric portico, and was considered the most perfect institution of its kind in Ireland: the city gaol, 18-4, is a large castellated structure, consisting of a centre with radiating wings, containing about 100 cells.

The commercial buildings news room, 1811, by Sir Thomas Deane: the county club, 1826, by Messrs. Pain, cost £4,000: the bank of Ireland, 1840, by Messrs. Deane, cost £3,500: the national bank, 1855 (Italian), by William Calbeck: the savings' bank, 1835, by Messrs. Deane, cost £8,000: the mayoralty house, 1767, by Davies Ducart: the butter market, plain, and remodelled 1852 by Sir John Benson, who added a Doric portico: the corn market, 1835, by W. and H. Hill, containing a museum of agriculture, cost £14,000: the military barracks, 1806: the Great Southern and Western Railway terminus, 1855, by Sir J. Benson: and the Cork and Blackrock Railway terminus (Italian), 1850, by Joshua Hargrave (illustrated in *ARCHITECT Journal*, ii, 355), comprise the important public works. The other buildings are the union workhouse; the loan bank; the chamber of commerce; the custom house; the two infirmaries; three convents; and three monasteries.

A bird's-eye view of "old Corke" is given in STAFFORD, *Hibernia Pacata*, fol., London, 1633; WINDLES, *Cork*, etc., Cork, 1839; CROKER, *Researches*, London, 1829; HALL, *Ireland*, London, 1824; SMITH, *History of the County*, Dublin, 1774; BARROW, *Tour in Ireland*, London, 1836; BREWER, *Beauties of Ireland*, 8vo., London, 1826; on the Dry Rot in Christ Church, by Sir T. DEANE, read at the Institute of Irish Architects, given in *BUILDER Journal*, vii, 321; the CORK, QUEENSTOWN, etc., *Guide*, 8vo., Dublin, 1852; and the ILLUSTRATED LONDON NEWS, iii, 133, and xv, 82, gives some views and descriptions.

R. R. B.

CORK abounds in quarries of hard grey limestone of close texture, some specimens of which bear a fine polish; as ashlar it costs about eightpence a cube foot, and from its hardness is expensive to work; the limestone district lies entirely on the south side of the river. On the north side are extensive quarries of red and brown clay slate stone, with some beds of green stone; these materials are commonly used in rubble walling, being unfit for ashlar, though sometimes used in small random ashlar work with limestone dressings, when contrast of colour is desired. When so used, it is 'punched', for it will not stand chiselling. Stone lime is plentiful and of good quality; the cost delivered is fifteen pence per barrel of four bushels. Sand, both pit and river, is delivered at one shilling and sixpence per ton. Bricks are made in the vicinity from the river deposit; they are of a bright yellow colour, generally badly moulded and unequally burned, and are delivered in the city at fifteen shillings per thousand. Youghal bricks are imported at twenty-eight shillings per thousand; they are dense, compact, and of a dirty brown colour. Bridgewater bricks are imported at about forty-five shillings per thousand. Flagging for pavements is

imported from Carlow at three shillings per square yard, and from Kilrush on the Shannon at two shillings and fourpence per square yard. Roofing slate is obtained from Wales, from Killaloe on the Upper Shannon, and an inferior description from the west of the county of Cork. WILKINSON, *Practical Geology*, etc., 8vo., London, 1845.

R. R. B.

CORK or CORK WOOD, see QUERCUS and ZIZYPHUS.

CORMONT (THOMAS DE), called CHARMONT by MILITIA, and COURMONT by other writers, continued the cathedral at Amiens, commenced 1220 by R. de Lusarches, and was succeeded by his son Regnault or Reginald, as will appear from the inscription given s. v. Lusarche. RENAULT is generally said to have finished the work 1288; but this statement is impugned by VIOLETTÉ LE DUC, *Dict.*, s. v. Cathédrale, p. 325.

CORN BIN. An enclosure or repository made of boards to contain grain and similar matters: in this article notice will only be taken of one required for a stable. If possible it should not be in the stable, like many lockers forming also seats in town stables: the proper place for it is in a loft above. The box should have at least one movable partition; one compartment being for the corn, and the other containing a hopper to the mouth of a shaft: the actual corn bin should also be shallower than the other compartment, and slope to it, to allow of its being sometimes cleansed. The shaft is made from 8 to 4 ins. square, stopping about 3 or more ft. short of the stable floor. It should not be placed as usual in a corner, unless it has a shoe to throw the provender into the measure or sieve; above the shoe should be two dampers (sometimes there are three), leaving a space for one-fourth of a peck, or 138-637 cubic ins. between each pair. The bin should be lined at the bottom and on the sides externally with iron, as softer metals are eaten away by rats. Allowing one peck to the three or four feeds per day of a horse, a space of two bushels or 4436-384 cubic ins. per horse per week will be sufficient for oats. BIN.

Sometimes the corn bin is made in divisions to hold, besides oats, the barley and beans which are often given. The provender for a farm horse may be two bushels of oats per week in winter and one in summer; for a horse used in quick work 66 lbs. chaff, 17½ lbs. beans, and 77 lbs. oats; and for a hunter, etc., 14 to 16 lbs. oats per day, with 8 or 10 lbs. hay; some farm horses get from 14 to 10 lbs. of grain, with from 20 to 30 lbs. partly of cut hay and partly of straw per day. Barley weighs about 50 lbs. per bushel, and the heaviest horse-corn about 40 or 42 lbs. per bushel. Upon other systems the horse requires per day 11½ lbs. corn; 10 lbs. corn and 33 lbs. hay; 8 lbs. oats, 3 lbs. beans, 4 lbs. chaff, 1½ lb. barley, and 22 lbs. potatoes; or 8 lbs. oats and beans; 25 lbs. chaff, and 11 lbs. potatoes. These appear to be the chief statements to be considered in determining the sizes of bins for a stable, except that 4 bushels = 1 coomb, 8 bushels = 1 quarter, and 40 bushels = 1 load, are the usual quantities placed in the loft at a time.

CORNE DE BŒUF or CORNE DE VACHE. The term given by the French architects to an arch which has a triangular plan and a semicircular or stilted elevation.

5. 25.

CORNELISZ (. . .) was invited 1531 from Schoonhoven to design and superintend the erection of the tower to the John Baptist church at Culemborg in Holland.

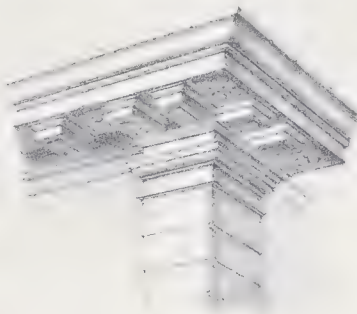
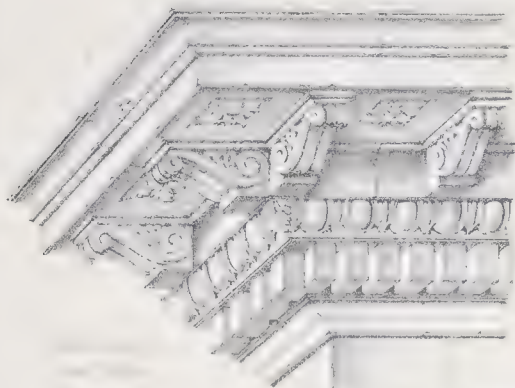
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CORNELIUS. Two architects of this clan were commemorated in an inscription at Rome: P. CORNELIUS Thallus P. Corneli architecti fil. Mag. Quinq. Coll. fabr. lignar. lustris xxvii nomine P. Corneli architecti fil. sui alleci in ordinem Decurion. fidei signum donum dedit; as given in GRÜTER, *Inscrip.*, fol., Amst., 1707, p. 99, ix.

CORNER STONE, see COVING.

CORNETO. A city in the legation of Civita Vecchia in the States of the Church. It was early the seat of a bishopric transferred from Tarquinia, but was also dignified with the title of city by a papal grant 1432: the battlemented walls with towers and five gates are perhaps earlier. The cathedral is dedicated to Sta. Margherita; but the *Handbook*; DENNIS,

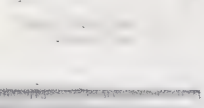
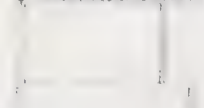
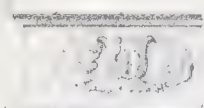
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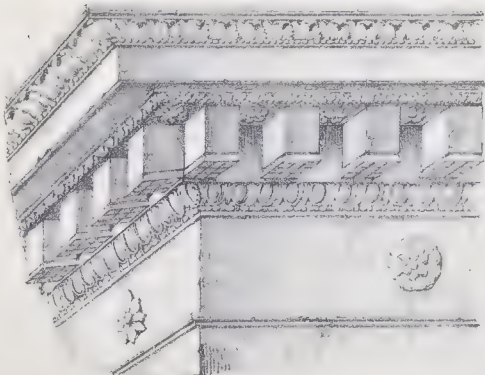
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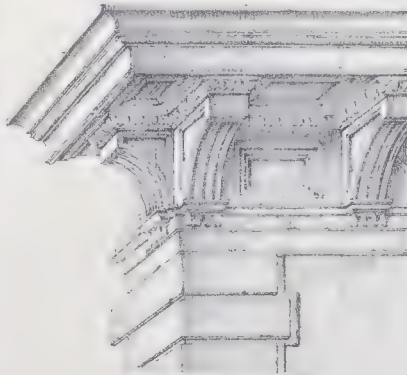
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Stapenia, ROME. T.H. Lewis, M.I.B.A.



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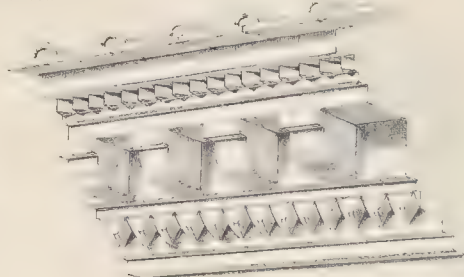
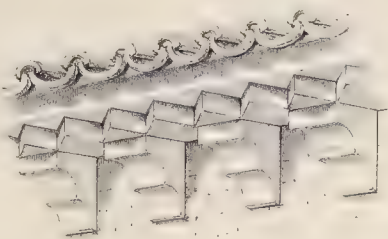
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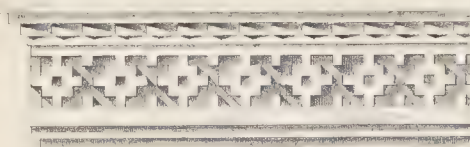
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CHURCH OF SAN STEFANO — ROME

CHURCH OF SAN GIORGIO — LABRO — ROME

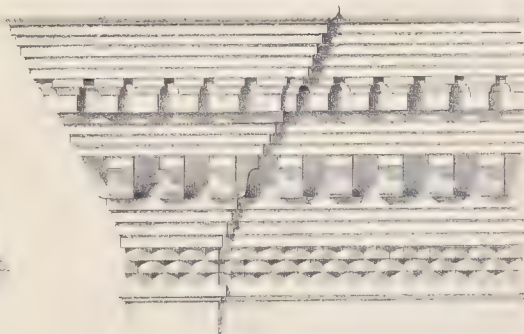
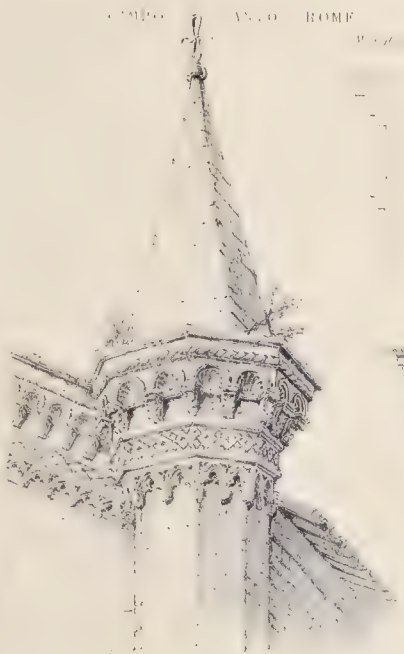
*H. Lundy, Esq.*



CHURCH OF THE SERVI — BOLOGNA

1531

*James M. Lockyer, M.L.B.A.*

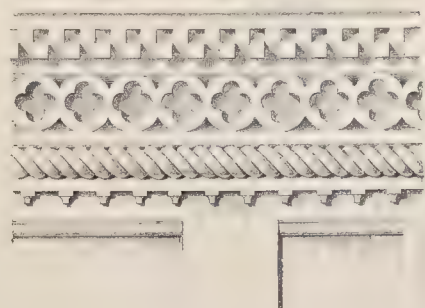


CHURCH OF SAN STEFANO — FERRARA

*James M. Lockyer, M.L.B.A.*

THE GREAT HOSPITAL — MILAN

*H. B. Garling, Jun., M.L.B.A.*



SANTO STEFANO — VENICE

1525

*James M. Lockyer, M.L.B.A.*

AT BOLOGNA

*Chas. Fowler, Jun.*





*Cities*, etc., 8vo., London, 1848; and GRAY, *Sepulchres*, 12mo., London, 1841, pp. 156-268, call it Sta. Maria di Castello: the last named writer says there are two cathedrals; the two collegiate bodies at Sta. Maria and S. Leonardo have long been united to that of Sta. Margherita. The cathedral appears to have been abandoned, except for three days in the year, since it was struck by lightning 1810, when three of the four horses found at Tarquinii and placed on the lofty campanile were thrown down; DE PRANGEY, *Essai*, mentions the use of diaphanous alabaster in some windows: Sta. Maria di Castello is illustrated under the date of the twelfth century by SÉROUX D'AGINCOURT, *History* (Architecture), fol., London, 1847, pl. 42, 64, 67, 73, who shows the celebrated dome, said to have been studied by Bramante for S. Peter's, which was destroyed by an earthquake 6 May 1819. This building belonged to the Franciscan *conventuali*, whose pretty cloister and conventual buildings still exist; the church has a pavement of *opus alexandrinum*. The four parish churches, the old castle, five monasteries, two nunneries, the episcopal palace, the large *palazzo del comune*, and the houses, are in many cases ornamented with marbles from Tarquinii; and afford examples of Italian Pointed art, especially in the façade (fifteenth century) and cortile of the palace of cardinal Vitelleschi, now an hôtel called the Palazzaccio. There are also three arched portions of a mediæval aqueduct. The city is less interesting than the neighbouring ruins of TARQUINII and its necropolis. 28. 96.

**CORNICE** (It. *cornice*; Sp. *cornica*; Fr. *corniche*; Ger. *kranz*). The capping formed to protect the body of a wall from wet, and to throw off the rain water from the roof beyond the face of the building. This capping in hot countries received a considerable projection for the sake of its shade as well. When building became highly artificial in structure and decoration, this capping, molded horizontally, formed in classic art the upper and considerably projecting portion of an entablature: a similar group retains the name if it be used without the rest of an entablature, to finish a story, either on the exterior of a building, or in the interior. In the latter case the cornice where it joins the wall to the ceiling is sometimes only a fillet or a single molding, and frequently extends on the ceiling like a molded soffit. The parts of a cornice are the bedmold, corona, and cymatium; on the projection of the corona depends much of the effect of the cornice, as respects shadow. When used alone, without any of the orders appearing in the design, its importance will be referred to *s. v.* CROWNING CORNICE. ARCHITRAVE CORNICE; BLOCK CORNICE. The cornice of a pedestal is usually called a CAP or CAPPING. COVE. IMPOST.

The *Illustrations* contain numerous examples of cornices in various materials; and those under 'Corbel' give several others. CORN MAGAZINE, see GRANARY.

**CORN MARKET** or CORN EXCHANGE (Fr. *halle aux grains*, *halle au blé*; the Spanish words *alfondiga*, *alholi*, *alhondiga*, *alhoi*, were properly the Arabic terms for a granary, thus became used for a corn market, and now are also applied to a magazine for salt). The market itself only requires to be a spacious, warmed and ventilated room, containing at convenient distances, say 4 or 5 ft. apart, the desk and locker, or 'stand' of each seller. It should be lighted from the roof, if possible, and it is best when the whole surface is glazed with clear glass. In some cases a coffee-room is attached. Portions of such edifices are sometimes devoted to other purposes, as at Reading and Coventry, where a music hall or assembly room occupies the upper portion: at Southampton the upper part serves for a chamber of commerce, reading room, etc. Plans and elevations of corn exchanges, which have of late years been largely erected throughout this country, will be found in the CIVIL ENGINEER, BUILDER, and BUILDING NEWS, *Journals*, and in the ILLUSTRATED LONDON NEWS.

**CORNUCOPIA** or Horn of Plenty. A horn broken from the head of the goat fabled to have nursed Jupiter, who gave it the property of giving spontaneously in accordance with the

wishes of its possessor. This horn, when represented as filled with wheat, flowers, and fruit, has been extensively introduced in antique and modern sculpture and decoration as a symbol of plenty, concord, and happiness.

CORNY (HERÉ DE), see HERÉ (EMMANUEL).

COROEBUS is mentioned by PLUTARCH, in v. Pericles, 13, as having commenced the building of the place where persons were initiated in the mysteries (? the temple of Ceres and Proserpine described in the *Ionian Antiquities*, fol., London, 1817, iii) at Eleusis, "where he placed the columns on their base-ments, and joined them by the architraves": after his death Metagenes Xypetius added the *diazoma* or *septum* and the upper columns.

COROMANDEL or CALAMANDER WOOD, see DIOSPYRUS.

CORONA and CORONIS (It. and Sp. *corona*; Fr. *larmier*, *mouchette gouttière*; Ger. *kranzleisten*). It is generally assumed that the Greek word *kopovis* meant something curved; and that the Romans had no generic term to express collectively all the members of a cornice. But as a curve or hook, *kopovis*, was used to mark the termination of a manuscript, the word was used to express a finish; and HESYCHIUS explains it as the finishing uppermost work of a building.

The word corona is now employed by English writers for the member which largely projects over the bedmold of a cornice, constituting the weather protection which is the natural and essential office of the cornice to give to the wall. It generally has a THROATING forming a BEAK and a CANAL on the soffit. VITRUVIUS, ii, 8, uses corona for a coping cornice; iii, 3, iv, 3 and 6, as a corona in the English sense; v, 2, as an interior cornice forming a string-course; and vii, 3, as an interior cornice. The corona of a cornice is sometimes omitted in classic examples, such as the temple to Pax, the third order at the Colosseum, and the arch of lions at Verona. In others its size is enormous, as in the frontispiece of Nero. 25.

**CORONA LUCIS** (Ger. *kronleuchter*). This term properly means a hoop or even polygon of metal work carrying lamps or candles; the hoop itself either being supported by a stand, as a candelabrum, or else dependent from a chain, as a chandelier. Several specimens of a candelabrum are shewn in GAILHABAUD, *Architecture*, s. v. *Couronnes de lumière pédiculées*; and also some hints might be taken from the same work, s. v. *Luminaire funèbres*: specimens of a chandelier are also given in the same work. Amongst the finest old examples are that attributed to Peter Vischer in S. Laurence at Nuremberg, having twelve lights; that in the cathedral at Augsburg, having open tracery work formerly enamelled with double branches; and one with lights not on a crown, but on flowering branches, in the chapel of the hospital of S. John at Bruges; besides that at Aix-la-Chapelle described by PUGIN, *Glossary*, 4to., London, 1844.

**CORONET**. A term adopted for the ornamentally cut and sometimes pierced decoration, which from the middle of the sixteenth century has been employed by European architects instead of the classic pediment on the cornice of a dressing to a window or to a door. Some elegant examples are given in KLENZE, *Sammlung*, fol., Munich, 1842. The plate xxiv of *Illustrations*, shows examples from the University of Glasgow; and in almost every work on Elizabethan and Jacobean architecture other specimens will be found of this peculiar ornament.

CORPS-DE-GARDE, see GUARD-HOUSE.

**CORPS DE LOGIS**. The French term for a building having a fore and back façade that are more or less decorated. The addition of the word *simple* shows that there is only one room between these walls; *semi double* signifies the addition of a corridor or of cabinets; the *corps de logis double* has two rooms or suites of rooms. *Corps de logis de devant* and *de derrière* respectively signify that the façade is in the line of street, or that there is a courtyard or garden between the street and the front of the building. *Corps de logis entre cour et jardin* is the usual description of a French town house. 5. 25.

CORPSE GATE, see LICHGATE.



CORRADI (ANTONIO), G. Gandolfo, A. Torriglia, and G. B. Grigo, were the four architects who designed 1655-60 the Albergo dei Poveri at Genoa, given in GAUTHIER, *Les plus beaux edifices*, fol., Paris, 1830, i, 47-9. PIER ANTONIO CORRADI altered the palazzo Balbi built by Bartolomeo Bianco, also called Baccio Bianchi, opposite another palazzo Balbi, now Durazzo, in the Strada Nuova at Genoa.

CORRANT. This word, which appears in an abstract of repairs at the Tower 24 Henry VIII, is supposed to be the term used at that period for a string-course or cornice. BAYLEY, *History*, fol., London, 1821, Appendix, xxiv. 19.

CORREA (FRANCISCO DE LA) is the name traditionally given to an architect whose signature was scarcely decipherable on the original drawings for the convento del Carmen Calzado, rebuilt 1628, and considered one of the finest buildings, if not the best, in Salamanca. 66.

CORRECTIONS, see OPTICAL CORRECTIONS; ATMOSPHERIC EFFECTS.

CORRESPONDENCE. The relation of one set of proportions to others in the various parts of a design. Thus a range of tall openings surmounted by wide low ones, or wide and low openings in a tower or campanile, are breaches of the correspondence which is requisite as a part of unity or wholeness in a design, and are rarely successfully introduced for CONTRAST.

CORRIDOR (It. *corridojo*, *corridore*, *corritojo*; Sp. *coredor*; Fr. *corridor*; Ger. *corridor*). The name, said to be derived from the late Latin word *corritorium*, for a handsome passage: it is properly the long gallery or passage of communication constructed in the length of a building with doors opening into apartments on one, or on both, sides of it. A corridor that is of moderate width may be appropriately furnished with works of art, etc., as that to the private royal apartments at Windsor Castle, and it is then sometimes called in England a GALLERY. 5. 6.

An arcade or gallery (Fr. *passage*) at Bath is called 'The Corridor'.

CORROSION. The gradual removal of a substance by chemical decomposition, as in the case of rust or the solution by weak acids, is commonly known by the name "corrosion", which in fact conveys the idea of an eating away. Many of the phenomena usually described under this term are alluded to in the separate articles upon building materials. DECOMPOSITION. RUST. G. R. B.

CORROSIVE SUBLIMATE. The common name for the bichloride of mercury. Corrosive sublimate has long been applied, and latterly on a large scale under Kyan's patent, for the preservation of timber, cordage, etc., by immersing the latter in a solution of that salt; but though this system has been perfectly successful so far as the preservation of the timber is concerned, when well carried into effect, it has not been able to contend with the cheaper process of creosoting, and is now nearly abandoned: it is also said to diminish the strength of the wood. The solution is obtained by mixing 1 lb. of the sublimate with five gallons of water. BIRKBECK, *Lecture on the Preservation of Timber by Kyan's Patent*, London, 1835; FARADAY, *Prevention of Dry Rot*, etc., Lond., 1836. G. R. B.

Corrosive sublimate has been used as a wash on stone work to prevent the growth of that incipient vegetation, which sometimes gives a green surface to ashlar masonry, especially when the stone is hard and not very absorbent; and it appears to be effectual in removing the vegetation, at all events for a time: this use of the liquid was originally suggested to the late Sir R. Peel by Mr. Fox Talbot. s. s.

CORRUGATED IRON. Sheet iron which has been rolled into the form of a series of waves is known in trade by the name of corrugated iron; and in that form it is frequently used as a covering either for temporary purposes, or when it may be desirable to avoid ordinary roofing. So great is the strength acquired by this puckering of the material into an alternation of counteracting arches, that a single sheet so thin that it will not stand alone in an upright position, may, it is said, when it

has undergone the process of corrugation, be loaded vertically with upwards of 700 lbs. without danger of bending. In England the waves or flutes are usually made very small, or about  $5\frac{1}{2}$  or 6 ins. from centre to centre; but in France they vary between this dimension and 13 ins. when the corrugated iron is used for the purpose of supporting the ballast of a railway bridge, and the thickness of the plates is increased; for roofing, however, the French contractors use precisely the same description of corrugations as the English. Occasionally the undulations are made by the rollers of a mill; at other times they are produced by hydraulic pressure upon a movable upper block driven down upon a fixed lower one; but generally the upper block is forced upon the lower one by simple percussion. Whatever system may be adopted, it must be evident that none but the very best plate iron is fit for the operation producing the undulations; the London manufacturers therefore prefer the best brands of the Staffordshire iron masters.

Corrugated cast iron plates of AAA shape, each flange being  $3\frac{1}{2}$  ins. wide, in 25 ins. by 45 ins. plate (total width finished) united by small bolts and tie-rods, forming a roof to a coal depôt of the London Gas Works, Vauxhall, erected by Mr. Hutchinson, C.E., are described as a novelty in LONDON, *Arch. Mag.*, 8vo., London, 1838, v, 66. Wrought iron plates, introduced about 1849, are generally advertised under the following conditions, the charge for corrugation being about £2 per ton above the price of plain sheets.

CORRUGATED GALVANIZED SHEET IRON.

Wire Gauge.	Sheets.	Weight per square of 100 feet super about		Sq. ft. per ton, about.
No.	Singles.	Cwt.	lbs.	
16	6 feet by 2 feet	3	0	14
18	to	2	1	1000
20	8 feet by 3 feet	1	0	6
	Doubles.			
22	6 feet by 3 feet	1	2	7
24	to	1	0	24
26	7 ft. by 2 ft. 6 ins.	1	0	1

No. 16, if curved; No. 18, if corrugated with small flutes; No. 20, if step corrugated; No. 22, if in sheets of extra size; Best quality; Best charcoal quality; are subject to extra charges. In calculating the measure for fixed roofing, add one-tenth to the weight per square for lapping. The sheets should overlap each other about 6 ins., and be double riveted at the joints; about 3 lbs. of rivets are required for a square of roofing.

It would appear that an extra charge is also made for plates above 6 ft. long, or narrower than 12 ins., or more than 30 ins. wide: and that the weights above given are in excess of those generally delivered, No. 16 weighing usually  $2\frac{1}{2}$  lbs. per ft. super, or 2 cwt. 1 qr. 26 lbs. per square. If it be important to keep out wet, the laps should be stopped.

There do not appear to be any trustworthy consecutive observations upon the strength of corrugated iron, nor any scientific investigations upon the increase of resistance resulting from the modification in the form of the plate iron thus produced; the architect is therefore dependent on advertisements. Railway bridges from 10 to 15 ft. span have been successfully made in cast iron on this principle; one at Tonbridge Wells, in Kent, is illustrated in DEMPSEY, *Tubular, etc., Bridges*, fol., London, 1850; also his *Iron applied*, etc., 4to., London, 1850, p. 39; LES NOUVELLES ANNALES DE CONSTRUCTION, 1856; DUMANET, *Cours de Construction*, Bruxelles, 1847; and CRESY, *Encyc. of Engineering*, 1847, give only some casual notices. The PRACTICAL MECHANIC JOURNAL, new series, 4to., Glasgow, 1848, i, 247, gives details of two experiments on corrugated iron used in girders.

In practice it is found that for spans of less than 25 ft. an arched roof of corrugated iron of the higher gauges will not require a tie-rod; beyond that span, it is essential to make some provision against the lateral thrust, as also against the "sagging" of the tie-rods themselves, and these rods are usually inserted at distances of 10 ft. asunder. When the corrugated iron is used instead of slating in pitched roofs, the purlins require to be placed at distances of 6 ft. from centre to



E.H. Martinelli, N.Y.B.A.

Printed at the





CAPITULUM







centre; and it is usually considered that the weight of this description of covering does not exceed one-fourth of that of the coarser Welsh slates upon close boarding under. Great attention must be paid to the constant repair of the painting to the corrugated iron used for roofing purposes; especially in boiler houses, engine sheds, and factories, where it is likely to be exposed to steam or acid vapours. Indeed so injurious is steam, even to the most carefully protected iron, that the application of the latter in roofs exposed to its action should be avoided as much as possible. Corrugated iron is of course not more exposed to this danger than any other iron; but its cheapness too often leads to the introduction of it in boiler houses and factories, and from its thinness it is soon eaten through. It is very largely used for the paneling of iron houses sent to the colonies, on account both of its rigidity and of its resistance to atmospheric influences; but the conducting power of the metal renders it indispensable that an inner casing of some non-conducting substance should be used.

BOILER PLATE. GALVANIZED IRON.

G. R. B.

CORRYNGHAM (JOHN) was appointed 14 October 1422 keeper of the palace within the castle of Dublin, and clerk of the works; and he is mentioned as repairing the hall, buildings, and towers of the castle 23 October 1430. WARBURTON, *History of Dublin*, 4to., London, 1818, p. 53.

CORS, see CORTIS.

CORS or CORSE. The name given by some of the mediæval writers to one sort of a pier or pillar, which is fully described in the articles BODY, BODY BOTERASSE, and BUTTRESS.

CORSA. The word used by VITRUVIUS, iv, 6, for each fascia employed to decorate an architrave.

CORSHAM DOWN STONE. This is an oolitic limestone presenting the usual characteristics of Bath stone, obtained from a quarry near the Box tunnel, in the neighbourhood of Bath. It is said to be usually free from the bars and vents found in the Combe Down stone, and being a particularly sound stone, that blocks can be obtained of any movable weight. It is finer in texture and more regular in quality than any other description of Bath stone: is worked cheaply, and is well adapted both for external and internal purposes, excepting plinths, for which a coarser stone is preferable. Below the beds of fine stone are two harder beds, distinguished by the name of Corn Grit; they are quite as good in colour and quality as the finer beds, but on account of its hardness the Corn Grit cannot be economically used for any purpose on which much labour is required. For heavy work it is very suitable, and also does well for steps and landings. One of these beds is usually 2 ft. 9 ins. deep; the other is 4 ft. to 4 ft. 6 ins. The beds of the fine or Corsham Down stone vary from 1 ft. to 4 ft. in thickness, and the blocks average 24 cubic ft. The analysis gives carbonate of lime 96.60, carbonate of magnesia 1.57, silica 0.90, and peroxide of iron, with a little alumina, 0.90 = 99.97. The same hill also supplies Box Ground stone which is said to be harder than Combe Down stone, but being less subject to vents, it is worked at less cost. It is coarse in texture, but sound in quality, is a good weather stone, and can be obtained in blocks of considerable dimensions; the beds vary from 1 ft. to 4 ft. in thickness; whilst the average size of the blocks is 20 cubic ft.

CORTILE. The Italian name adopted in English for the internal area or courtyard of a palace or other large edifice, and in former times even for the central hall or saloon, reaching nearly, if not quite, to the roof. Four sorts of cortili were recognized, viz. uncovered with a colonnade or arcade, etc., uncovered without a colonnade, and covered cortili of both species. COURT. 6.

The *Illustrations* give that at Caprarola by Barozzi da Vignola, before 1573, about 70 ft. in diameter; and that of the great hospital at Milan, by A. Filarete.

CORTIS, with CORTILE, cortina, and all their corruptions and diminutives, simply express one idea, an area enclosed by

ARCH. PUB. SOC.

premises, which, as shewn by DUCANGE, *Gloss.*, has varied in importance, from the farm-yard of a villa or farm-house to the collection of dwellings in which serfs or villeins dwelt around their lord. The English terms 'court', 'curtain', and 'curtilage', are all connected more or less immediately with *cortus*, *cors*, and *cortis*.

CORTONA. A city in the province of Florence in the grand duchy of Tuscany. The present town is enclosed by a wall built about the thirteenth century. This for about two miles, or nearly two-thirds of its whole extent, consists of the original wall, sometimes 25 ft. high, built of the local grey stone called *macigno* in horizontal courses, without cement, consisting of rectangular blocks from 14 to 7 ft. long and from 5 to 3 ft. high. The cathedral, dedicated to the Assumption, and said to date from the tenth century, was rebuilt and inaugurated 1507 according to WEBB, *Sketches*, 8vo., London, 1848, but it was restored in the eighteenth century by A. Galilei: the stalls are in a rectangular choir behind the altar (this is also the case in S. Agostino): the church del Gesù opposite, which is used as the baptistery, has a rich flat panelled and painted roof. S. Cristoforo, rubble built, consecrated 1192, with a western gallery and a plain double bell-gable; S. Marco, of the thirteenth century but modernized, with a good circular western window, but no chancel; Sta. Margherita, with the names of Nicolo and Giovanni da Pisa in an inscription on the tower; and S. Filippo, with a small dome, are the parish churches. Of four monasteries and two nunneries, those of S. Domenico and S. Francisco both date in the thirteenth century, have a broad nave without aisles, and a chancel between two chapels, all of which are rectangular; in the former is a well. The other chief buildings are the episcopal palace, the seminario, two hospitals, and the palazzo Passerini, which dates 1570: another mansion called il Palazzone, belonging to the same family, and situated about a mile from the city, possesses some fine painted glass by the celebrated Guillaume de Marseilles. A small sepulchral building, near one of the gates, is called the grotto of Pythagoras, and is interesting from the timid precaution shewn by the builders of an arch in it; DENNIS, *Cities*, etc., 8vo., London, 1848.

CORTONA, see BOCCADORO and BERRETINI.

CORUMBUS, supposed to have been a freedman of Balbus, is mentioned as *bellus architectus* by CICERO, *Ep. ad Atticum*, xiv, 3.

CORYCÆUM, or CORICEUM. A chamber in the porticos of a *palaestra* or exercising ground, in connection with rooms where the wrestlers were anointed (*eleothesium*) and sprinkled with dust (*conisterium*), mentioned in VITRUVIUS, v, 11. BALDUS and PHILANDER suppose it to be the place where young girls (*κόραι*) exercised, but they would hardly be placed among the men, even if it could be proved they habitually attended a gymnasium. BARBARO derives the word from *κορίκειον*, a football, but such a game could not be played in a chamber. It is more probably derived from *κόρυκος*, a leather sack filled with bran, etc., on which athletæ, like the modern wrestlers, exercised themselves.

A. A.

CORZE (PIETER) was town architect at Rotterdam, where he with C. van Driel, built 1613 the *Oost-poort*. VAN SPAAN, *Historie van Rotterdam*. 24.

COS, in the Grecian archipelago, see MYCENE.

COSA, afterwards called ANSEDONIA. A ruined city in Etruria, about one mile in circuit. It is the only place where walling of polygonal blocks has a chain of towers, each about 20 ft. square, interrupting the wall, which thus forms curtains between them on the interior as well as outside; the rise of the walls above the level of the enclosed area, and their parapet 3 ft. high and 6 ft. thick, being features unknown in such work elsewhere; the upper portions, however, have horizontal courses. The towers are upright, but the curtain has a slight batter. DENNIS, *Cities*, etc., 8vo., London, 1848, ii, 269.

COSENZA. A fortified city with a large citadel, in the



province of Calabria Citra in the kingdom of Naples. A fine old cathedral dedicated to the Assumption, an archiepiscopal palace, three parish churches, as many monasteries and as many convents, a large *seminario*, a royal college, a magnificent palace of justice or *tribunale* which is one of the chief buildings in the kingdom, a fine *ospedale*, and a theatre, are the most important public edifices. 96.

COSMAS. Several distinguished writers on the history of architecture profess to trace in the following order the members of a family which those authors agree to call COSMATI or COSMATI: viz. LAURENTIUS and his son JACOBUS, employed (date not known) at the old church in Falleri, near Civita Castellana; 1205 JACOBUS at S. Saba in Rome; 1210 JACOBUS and his son COSMAS at the cathedral in Civita Castellana, and at the hospital di S. Tommaso in Formis, now the villa Mattei, at Rome; COSMAS at the cappella del Sancta Sanctorum, or di S. Salvatore alla Scala Santa, in the Lateran; 1230 COSMAS, civis Romanus, and his sons LUCAS and JACOBUS at the crypt of the cathedral in Anagni; and 1235 at S. Benedetto in Subiaco; his son JOHANNES at Sta. Balbina, 1296 at Sta. Maria sopra Minerva, and 1299 at Sta. Maria Maggiore; 1290, DEODATUS, son of Cosmas, at Sta. Maria in Campitello, and with JACOBUS at Sta. Maria in Cosmedin, all at Rome; and 1293 JACOBUS, son of Cosmas, at the cathedral in Orvieto. The authorities for these statements concerning the predecessors and rivals of the Pisani are given by WITTE in the *Kunstblatt*, 1825, and by NÄGLER, *Kunstler Lexicon*, 8vo., Munich, 1836, with corrections of the mistakes of their predecessors, D'AGINCOURT, CICOGNARA, etc.

COSSACK HUT (Fr. *maison à la Cosaque*; Ger. *Kosackischen-haus*). The name for the large class of log cabins or huts rendered ornamental features by artistic skill. This class is generally distinguished from the so-called Polish or rustic hut, which allows the use of brick or stone, and from the so-called Dutch or Swiss hut, which allows the use of planking, by having the logs, placed either horizontally or upright, still covered with their bark. Specimens are given in KRAFFT, *Plans des plus beaux Jardins*, fol., Paris, 1809, i, 15, 26-7, 47, 68-70, 78-80, 94; ii, 37, 48; and PAPWORTH, *Hints*, 4to., Lond., 1823, p. 78.

COSSANDRO, see CASSANDRO.

COSSUTIUS. When Antiochus Epiphanes, king of Syria B.C. 176-164, promised to defray the expense of finishing the temple at Athens to Jupiter Olympius, untouched after its foundation about 540-527 B.C., a Roman citizen named COSSUTIUS, was employed, according to VITRUVIUS, vii, preface, to determine the size of the cella, the positions of the columns, and the design of the entablatures and other ornamental features; a task which this author says was executed with much skill and the greatest science, on Corinthian relations and proportions. As the temple was not completed until the time of Hadrian, it is uncertain whether the present ruins exhibit any mark of the work of COSSUTIUS. STUART and REVETT, *Antiquities*, fol., London, 1827, iii, 80. In LONDON, *Arch. Mag.*, 8vo., London, 1838, v, 110, it is suggested that the whole name was Decimus COSSUTIUS, son of Publius.

COSTA E SILVA (JOSÉ DA), one of the most distinguished Portuguese architects, born 1747, studied under Ponzoni and Lant at Rome, where he obtained many prizes, and was made a member of the Academy of S. Luca. He became the first professor of architecture in the Royal Academy at Lisbon, where he built 1792 in six months the theatre of S. Carlos, and afterwards held the same position at Rio Janeiro, where he became intendant-general, and designed many public buildings. At his death in 1825 the theatre of S. João was incomplete, and was finished 1826 by Manuel Costa. 63.

COT or COTE. A small dwelling with wattled sides. The term is applied to any roofed enclosure for animals, as sheep cote in contradistinction from fold; also for birds, as DOVE COTE.

COTE, see COTTE (ROBERT DE).

COTERA (PEDRO DE LA), executed 1541-53 the façade of the colegio mayor de S. Ildefonso at Alcalá de Henares, from

the designs of R. Gil de Hontanón, and constructed, perhaps from his own designs, the second court with thirty-six Composite columns, and the court called *trilingüe*, with thirty-five Ionic columns (finished by him 1557) to the same structure. 66. 85.

COTLOFT. Another name for COCKLOFT.

COTOGNOLA (ANTONIO MARIA VERTEMATE) was elected about 1743 one of the architects to the cathedral at Milan. 27.

COTRONA or COTRONE. A city in the province of Calabria Ultra in the kingdom of Naples. The old cathedral, dedicated to the Virgin, and five parish churches, a convent, and two hospitals, are the chief remarkable buildings. At Capo della Colonna, or Capo Nau, about six miles southeast of the town, one Doric residence, 26 ft. high, still remains of the temple to Juno Lacinia. 28. 96.

COTTAGE. The habitation of the agricultural labourer. Ascending from the hovel, shed, booth, hut, cot, bothie of former times or cabin, and bothie since 1840, the dwelling, however constructed, of the poorest classes in the country has been so far improved as to contain from two to four rooms with permanent walls and roof: the log-cabin of a settler is a specimen of a true cottage. The term has been adopted, however, for a small residence, at first in the country, then in suburbs, and now even in towns: while subsequently such tenements in suburbs and in the country have been termed 'lodges' and 'villas'. The designation *cottage ornée* was invented about 1795 by John Plaw.

The following works illustrate the English labourer's cottage as it had been, and as it was proposed to be: from them it will appear that architects have during the whole of the present century endeavoured to show to landlords their duty in this respect. ATKINSON, *Cottage Arch.*, 4to., 1805; BARTELL, *Hints*, 8vo., 1804; DEARN, *Cottages*, etc., 4to., 1807; ELSAM, *Essay*, 4to., 1803, and *Hints*, 4to., 1816; GANDY, *Designs*, 4to., 1805; GARRETT, *Designs*, fol., 1750; GYFFORD, *Designs*, 4to., 1807; HALFPENNY, *Designs*, 8vo., 1751; LAING, *Hints*, 4to., 1800, 1804; LUGAR, *Country Gentleman's Architect*, 4to., London, 1807, 1823, 1828; and *Cottages*, 4to., 1828, 1840; MALTON, *Essay on British Cottage Architecture*, 4to., 1798, 1804 (very rare); MILLER, *Country Gentleman's Architect*, 4to., 1787, 1797, 1800; MIDDLETON, *Views for Cottages*, 4to., 1795; PAPWORTH, *Rural Residences*, 4to., 1818; PLAW, *Rural Architecture*, 4to., 1796, and *Sketches*, 4to., 1800; POCKOCK, *Sketches for Rustic Cottages*, 4to., 1807, 1819; SMITH, *Remarks*, 4to., 1797; STEVENS, *Domestic Architecture*, 4to., 1816; WOOD, *Plans*, fol., 1792, are works either entirely, or in some measure, devoted to the consideration of the true cottage: to these may be added others by DUBOURG, JOHNSON and CRESY, and WYATT; with the scattered notes in LONDON, *Encyc. of Agriculture*, 8vo., London, 1831.

It was not until about the year 1835 that landlords and philanthropists took the matter seriously in hand. Since that period numerous plans of model cottages have been devised, and much has been written on the subject in various periodicals: the gist of the whole appears to be the fact that until a pair of semi-detached cottages, each containing three bedrooms and a kitchen, with other conveniences, can be built so cheaply that the two tenants can pay rents returning 10 per cent. on the cost, or else that they can be built for 100 guineas the pair, the absence of decent cottages is to be charged upon the profession interested in improving them (SOCIETY OF ARTS, etc., *Journal*, 5 February 1858, and *passim*), whereas the following list will show the labour architects have bestowed upon the subject. Besides the works published in London by ALLEN, *Cottage Building*, 12mo., 1849, 1854; BRITTON, *Cashibury*, fol., 1838; ELLIOTT, *Construction*, 8vo., 1850; GODDARD, *A Pair of Cottages*, 1854, and ISAAC, 1857, being the prize essays of the Royal Agricultural Society; GOODWIN, *Designs*, 1833, and supplement, 1835; HINE and NICHOLL, *Detail Working Drawings*, etc., 4to., 1843; HUNT, *Architectura*, 4to., 1827, 1834, *Half-a-dozen Hints*, 4to., 1825, 1835, and *Designs*, 4to., 1836,

1841; ROBERTS, *Cottages on the Duke of Bedford's Estate*, fol., 1849, and *Dwellings for the Labouring Classes*, 8vo., 1850; ROBINSON, *Rural Architecture*, 4to., 1826, and supp., 1830, *Designs*, 4to., 1830, *Designs*, 4to., 1833, *Designs*, 4to., 1837; SANDERSON, *Rural Architecture*, 8vo., 1853; WAISTELL, *Designs*, 4to., 1827; WEAVER, *Hints on Cottage Arch.*, fol., 1848; also his *Hints on Village Arch.*, fol., 1850; and WILD, *Practical Instructions*, etc., 8vo., 1835, reference should be made to those by ALLEN, *Rural Architecture*, 12mo., Norfolk, 1852; DEAN, *Construction*, 4to., Stratford, 1849; GRAY, *Treatise*, 8vo., Edinburgh, 1853; HARTSHORNE, *System, etc., of the Duke of Bedford*, 8vo., Northampton, 1849; SMITH, *Essay*, 8vo., Glasgow, 1834; the publications of the various SOCIETIES for *Improving the Condition of the Labouring Classes*; and the BUILDER, CIVIL ENGINEER, ILLUSTRATED LONDON NEWS, and BUILDING NEWS JOURNALS, *passim*. The general requirements of a cottage as to quantity of land, site, walls, roof, number of stories, and of rooms, etc., have been tolerably discussed in the *Report of the Poor-Law Commissioners on Sanitary Inquiry*, 8vo., London, 1842; also given in LOUDON, *Encyc. of Cottage, etc., Architecture*, 8vo., London, 1842; and in GWILT, *Encyc.*, sec. 3007. A good description of the Northamptonshire stone cottage, with notes on the variations and requirements of labourers' cottages, is given by JAMES, in the *United Societies' Papers*, 8vo., London, 1850, i, 24.

The cottage is usually constructed of purely local materials and of the roughest workmanship. However limited in size, it should contain the following essential points, viz. an ordinary sitting room to be used as a kitchen, a small apartment or out-house adjoining for a washhouse, stowage for coals, wood, etc., and a larder; at least three sleeping rooms are necessary for the decent accommodation of a family; a privy should be provided for each cottage, with receptacle for dust and refuse, and ready access to good water.

Too much attention cannot be paid to this subject, since the moral condition of the lower classes is so much affected by the circumstances under which they are surrounded in the domestic circle. It is a question whether a certain number of cottages to be rented by the labourers should not always form a portion of the necessary buildings of a homestead, the rents being paid through the farmer, and deducted from their wages: a great advantage would result to all parties interested from an arrangement of such a nature. STEPHENS, *Farm*, 8vo., London, 1844, ii, 546.

COTTAR and COTTRELL, see KEY in wedding.

COTTAR, COTTARD, or COTTART (PIERRE), became *architecte du roi*. He designed the whole church of the Pères de la Merci at Paris, except the second order of the front, which was added by Boffrand; the columns of the lower order are oval on plan. He built about 1650, for Amelot de Bizeuil, an hôtel, afterwards called de Hollande, in the vieille rue du Temple, in the same city, given in the large work of MAROT, and in BLONDEL, *Architecture Française*, fol., Paris, 1752, ii, 153, from six plates executed by Cottard himself. He published 1686 *Recueil des œuvres des desseins faits pour sa Majesté et autres seigneurs*; and, without date, the *portail des pères de la Merci*; a suite de vases, altar-pieces, etc.; a suite de portes; and a suite de lambris. BLONDEL, *Cours*, 8vo., Paris, 1771, iii, preface, ciii. 5. 60. 68.

COTTE, also written CÔTE (ROBERT DE), grandson of Fremin de Cotte (who served as engineer at the siege of Rochelle, and was architect to Louis XIII), was born at Paris 14 January 1657, and is said to have studied under, or to have been clerk to his brother-in-law, J. H. Mansard, to most of whose appointments he succeeded. He was made 1687 a member and (on the death of F. Blondel) director of the Academy of Architecture; 1 March 1699 *architecte du roi*, and controller-general; 7 March an honorary member, and (30 June 1705) vice-patron of the Academy of Sculpture and Painting; received his letters of nobility in March 1702; was made *conseiller du roi*, and became 10 June 1708 chief royal architect, in-

tendent and ordonnateur-general of royal buildings, gardens, arts, and manufactures; and also chevalier of the order of S. Michael on the death of Mansard, whose works he continued at the dome of the Invalides, the chapel at Versailles, and the house at Trianon to which he made considerable additions, inclusive of the Ionic order of columns. The dates above given are preferred to those in LAMBERT, *Histoire Littéraire*, 4to., Paris, 1751, iii, 130, or in D'ARGENVILLE, *Vies*, 8vo., Paris, 1788, i, 412. He was employed in making designs for the elector of Cologne for buildings erected at Popelsdorf; the elector of Bavaria; the count de Hanau; the bishop of Wurzburg; the episcopal palace at Strasburg; and many grand decorations of that at Saverne; the *grenier de l'abondance*, the front of the *salle du concert*, and the episcopal palace (not completed) at Verdun; the place de Belle Cour, or de Louis XIV, at Lyon; the episcopal country residence called the château de Frescati, near Metz; and the French royal buildings, gardens, fountains, and other ornamental works; especially the *vœu* or high altar promised by Louis XIII, and executed 1708-14, at the same time with the decoration of the choir and sanctuary of Notre Dame (engraved in fifty-four plates by Le Pautre). BLONDEL, *Architecture Française*, fol., Paris, 1752, has engraved those buildings in Paris next mentioned, viz. besides Notre Dame, ii, 107; 1704 the hôtel d'Estrées in the rue de Grenelle, i, 230; 1710 the hôtel de Ludes in the rue S. Dominique, i, 252; 1713-19 the *galerie*, iii, 27, of the hôtel de la Vrillière, afterwards de Toulouse, built 1620 by F. Mansard in the rue de la Vrillière, and now occupied by the *banque de France* (BUILDER *Journal*, 1857, p. 10); 1713 the hôtel de Le Gendre d'Armini, afterwards called hôtel d'Antin and de Meulan, in the rue des Capucines, iii, 117; and 1716 the hôtel de Conty, afterwards du Maine, in the rue de Bourbon, i, 276: besides which the church of S. Roch; the château d'eau, called the Samaritaine, upon the pont Neuf; and the façade of an oratory in the rue S. Honoré, were designed by him, although the merit of the last named work was claimed by the mason Caquié. Some other designs chiefly, if not entirely, executed after 1735, will be mentioned under the name of his son, except the new buildings and gardens (engraved by Le Pautre) of the abbaye royale de S. Denis, which were continued by the elder Gabriel. The decoration of chimney-pieces by mirrors, and the consequent general use of looking-glasses as wall ornaments, are considered his invention by D'ARGENVILLE and by PATTE, *Monumens*, fol., Paris, 1767, p. 6; and in BLONDEL, *Cours*, 8vo., Paris, 1771, iii, 352, vi, 479, who considers him only inferior to Perrault and Mansard. A portrait engraved by Drevet after Rigaud, and another by Trouvain after Torteat, exist of Robert de Cotte, who died at Passy 15 July 1735, in his seventy-ninth year. 5. 45. 60. 68.

COTTE (JULES ROBERT DE), son of the preceding, was controller-general of the royal buildings, when he was elected 25 January 1710 an honorary member of the Academy of Sculpture and Painting in Paris; in 1711 he was made a member of the Academy of Architecture; and in 1736 he had succeeded to his father's appointments of intendent-general of buildings and director of the medal mint, when he executed the elder De Cotte's celebrated design (transitional in its decorations from the style Louis XIV to that of Louis XV) for the façade of the church of S. Roch, given by BLONDEL, *Arch. Fran.*, iii, 119, and *Cours*, pl. 86, ii, 190. He is also supposed to have carried out his father's designs for the *portail* of the church of the hôpital de la Charité, given in the *Arch. Fran.*, i, 296, and for the château d'eau, opposite the palais royal, *Arch. Fran.*, iii, 47; DUVAL, *Fontaines*, fol., Paris, 1812, p. 21. He died 8 September 1767. 45.

Another DE COTTE, whose name is not given, but who is called a brother of Robert (? of Jules Robert), was elected into the Academy of Architecture at Paris 1725, and died 1742. 45.

COTTINGHAM (LEWIS NOCKALLS), born 24 October 1787, at Saxfield in Suffolk, was apprenticed to a builder at Ipswich, and was subsequently an architect's clerk in London until



1814. From that period until 1822, in which year he became surveyor to the Company of Cooks, he was engaged in the preparation of various important publications, comprising *Plans, etc., of Westminster Hall*, 6 plates, fol., London, 1822; *Plans, etc., of King Henry VII's Chapel*, 72 plates, fol., London, 1822-9 (only the first volume of 45 plates is usually seen); *The Ornamental Metal Worker's Director*, 71 plates, 4to., London, 1823, called the *Smith*, etc., with 11 more plates, 1824; *Ornaments, etc., selected from Stuart*, etc., 24 plates, fol., London, 1824; and *Working Drawings of Gothic Ornaments, etc., with a Design for a Gothic Mansion*, 38 plates, fol., London, 1824. He built Snelston hall in Derbyshire, for James Harrison, esq.; and 1825 executed a new central tower, with restorations of many other portions of the cathedral at Rochester, for which he was presented with a considerable sum after his own charges had been paid; the new cathedral at Armagh, 1834, with the exception of a very small portion, the north-west tower of the church at Milton Bryan in Bedfordshire, and the savings' bank at Bury, were also erected from his designs. In 1829 he was the successful competitor for the restoration (finished 1833) of the interior of the chapel in Magdalen college at Oxford. The chief grounds of his reputation, indeed, were the numerous important repairs and restorations which he directed in cases where economy was demanded, although the works were both difficult and extensive. Into this list would enter the cathedral at Hereford; the abbey church at S. Alban's, 1833; the church of S. Mary at Bury S. Edmund's, with those at Theberton, Horningsheath, and Market Weston, all in Suffolk, at Ashbourne in Derbyshire, Chesterford in Essex, Clifton in Nottinghamshire, and Ross in Yorkshire; the celebrated spire and tower of the church of S. James at Louth in Lincolnshire, which had been damaged by lightning; the Norman tower in Bury S. Edmund's; and works at Brougham castle in Westmoreland, for Lord Brougham; at Elvaston castle in Derbyshire, for Lord Harrington; and others. He also published with the late J. Savage, *Reasons against the destruction of the Lady chapel at S. Mary Overy, Southwark*, 8vo., 1832. He died 13 October 1847, and was buried at Croydon church in Surrey. *BUILDER Journal*, v, 502.

**COTTINGHAM** (NOCKALLS JOHNSON), who conducted the works at Hereford during the last years of his father's illness, is supposed to have perished with the steamer *Arctic*, 1854, at the age of thirty-one years. *BUILDER Journal*, xii, 624.

**COTTON WOOD**. A timber obtained in Ashantee in Western Africa. Doors are made of it in entire pieces, and occasionally the floors are of the same material. *BOMBAY*.

**COTTRELL** and **COTTAR**, see **KEY** in wedging.

**COTURNABA**. A wood of Ceylon occasionally used in house building, but not esteemed. **71**.

**COUBERGER**, see **COEBERGER** (WENCESLAUS DE).

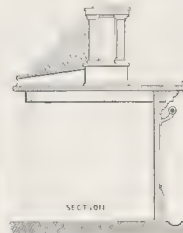
**COUCY**, sometimes miscalled **COURCY** (**ROBERT DE**). He was employed about 1296 to continue the church of S. Nicaise at Reims, after the death of H. Libergier, 1263; and was also engaged upon the cathedral in that city; according to **FELIBIEN**, *Recueil*, 4to., Paris, 1686, p. 226, who gives the epitaph on the tomb in the cloister of S. Denis there, viz. "Cy gist Robert de Coucy maistre de Nôtre Dame et de Saint Nicaise qui trépassa l'an 1311"; **GERUZEZ**, *Descr. de la ville*, 8vo., Rheims, 1817, i, 308. Either there were two architects of this name, or else **VIOLLET LE DUC**, *Dict.*, i, 111, and ii, 315-23, has confused Coucy with Pierre de **CORBIÉ**; as the cathedral, commenced 1211, had its choir constructed perhaps 1215, but certainly not used until 1240, while the towers and exterior were incomplete in 1295; one tower, indeed, was not finished until 1430; **INKERSLEY**, *Inquiry*, 8vo., London, 1850, p. 84.

**COULANDON STONE**. This is a *gris psammite* or burr stone, which takes its name from the place of its quarry, near Souvigny in France. The bridges of Moulins and Nevers exhibit magnificent greyish-red stones from these quarries. **BRARD**, *Mineralogie*, 8vo., Paris, 1821, ii, 46.

**COUNCIL CHAMBER**. The place of meeting for deliberation of the representatives of a corporation. It usually had a dais for the chief officers at one end, and a gallery at the other extremity, with waiting rooms, etc.; at present a room without any structural character, special arrangement, or even dependencies, is frequently employed for such meetings.

**COUNTER**. The long narrow table in shops, warehouses, offices, etc., for the display of goods or for the payment of money. It varies in height, width, and general character, according to different trades and purposes for which it may be required. It is usually 2 ft. 11 ins. high, being rather less than more, and from 27 to 36 ins. wide, according to the nature of the business and the size of the apartment. Counters at which there is no intention of having seats are often made higher. The top is generally of mahogany, which if more than board wide should be feather-tongued, and buttoned to stout deal backings or framing. **H. B. G.**

The bank counter should not be less than 3 ft. 4 ins. high and 4 ft. in width. It is usually made of Spanish mahogany plank in one piece, or when joined is connected by a brass band sunk in flush with the counter. It should also have a strong metal edging rising  $\frac{3}{4}$  in. above the top on the public side, to prevent money rolling off. This counter is fixed upon a strong deal framing, and to which it is screwed from the under side. The front framing is usually made of wainscot, and molded or bead flush on the face, which is set 6 ins. within the edge of the counter. Upon the counter at stated intervals are placed the cashiers' desks, averaging 5 ft. apart, each one occupying 3 ft. more. It is a rule that the cashier pays only on one hand, and on the same side is placed beneath the counter a nest of drawers divided into compartments severally for notes, gold, silver, copper, etc., and another for cheques and bills received or paid; and on the other side a wire guard is placed



for protection. The desk is surmounted by a screen composed of mahogany or brass, filled in with wire work or ground glass panels, about 18 ins. high. Where the counter is made circular, whether convex or concave, it is necessary on the public side that the average distance should be 8 ft. from centre to centre of the clerks' desks. It is desirable to have a sunk metal gutter in the floor 3 ins. wide, and a brass rail supported on brackets for the counter, for umbrellas. **J. T.**

**COUNTER APSE**. An apse opposite to another. Examples of these double apses may be named from the basilica at Treves, from two churches at Falaise and one at Nevers in France; from the well known plan of the monastery of S. Gall; the old church at Fulda; and the former cathedral at Cologne; from the cathedrals at Augsburg, Bamberg, Mainz, Naumburg, Speier, and Worms; from the churches of S. Stephen at Mainz, S. Sebald at Nürnberg, S. Catherine at Oppenheim, from others at Drübeck, Essen, Gernrode, and Lüttich; and from the Saxon cathedral at Canterbury; many of these have a crypt below the western apse. The fashion therefore lasted from the ninth into the thirteenth century. **QUAST**, in 121 of the *Zeitschrift*, 1852, endeavours to show that the existence of the counter apse was due to the formation of monastic buildings, in which monks and nuns were housed, so that each sex would have its own apse, etc. Double apses, semicircular or rectangular, as at the churches of S. Servais at Maestricht, of S. Bartholomew at Liège, and of the Virgin at Ruremonde, are mentioned by **SCHAYES**, *Hist.*, 12mo., Bruxelles, 1853, iii, 31.

**COUNTER ARCH**. An arch used to counteract the thrust of another arch. **INVERT**.

**COUNTER CEILING**. This, which was apparently an old term for what is now called **RUGGING**, is at present employed for

a ceiling placed, in case of disturbance from an upper room, at least two feet nine inches, under one already formed, so that the space between may be heaped with sawdust as a means of excluding the offensive noise. Such a counter ceiling requires to have its joists roughly floored, with at least one panel, serving as a manhole, which is generally central and has a trap door. The space around it, between the ceilings, is then filled with sawdust, and a few blows shake enough down to cover the trap door after it is placed *in situ*. The ceiling is then plastered and decorated as usual.

**COUNTERFIXED PIECE.** The name used by early English writers on building as the translation of the French word *contrefiche*, for a strut or brace, in a roof, placed at an angle of about 45°. PRICKE, *Art of Fair Building*, fol., London, 1670.

**COUNTERFORT** (Fr. *contre boutant*, *contresfort*, *éperon*). A projection upon the interior of an abutment or a retaining wall, for the purpose of resisting a direct effort of detrusion, or of dividing the action of the inner load. In the former case the moment of resistance of the counterfort must be equal to the moment of the force tending to overthrow the wall; in the latter the function of the counterfort becomes less important, and it is even preferable to make the retaining wall strong enough to resist the thrust of the ground without reference to the increase of strength given by the counterforts. In quay walls the counterforts may be advantageously used as foundations for mooring posts, bollards, etc. BUTTRESS. G. R. B.

**COUNTERFORT** is also used to designate any buttress, pier, or spur, built against the front of the wall of a building, or of a terrace, to strengthen it: the French writers call the external face of such a buttress the *queue* or tail, while the part which abuts against the wall is called the *racine* or root. If the thrust of one arch be balanced by that of another, the latter is called a counterfort. 1.

**COUNTER LATH.** The name given in battening or lathing for roofing to each lath placed by the eye between every two laths that are laid to a gauge, *i. e.* at fixed distances; so that the laths are alternately gauged and countered. But there is another use of the term, both in England and in France, when one side of a partition was plastered, or the outside of a roof was finished, the other side was said to be counter lathed when prepared for plastering. 1. 2. 3. 5.

**COUNTERLATHING.** Where transverse timbers join longitudinal ones, or wherever else timbers to be lathed run in different directions, it is necessary to lath upon battening or to double lath by crossing one set of laths over another, which is called counterlathing, in order to avoid the crack that otherwise invariably occurs at such a place: this is an ancient practice, see VITRUVIUS, viii, 3. H. B. G.

**COUNTER LIGHT.** The old term for a window opposite to another, and for the light which is obtained from it. 4.

**COUNTERSINK.** The name peculiar to that sort of bit which is used for widening the upper part of a hole in wood or iron, as for the reception of a washer and screw, or the head of a bolt, pin, or screw; so that the timber or other material may have a flush surface with the bolt head: the hole itself is said to be countersunk. The instrument has a conical head, the angle of the vertex of that cone being about 90°, and on the head is left one or more cutting edges. A countersink bit for wood has one cutter, and that for iron has two cutters; while that for brass has about a dozen, so that its section would resemble that of a circular saw, and such a bit is called a rose countersink. 23.

**COUNTER WALL.** When there is not a party wall between adjoining buildings, the more recent either has no wall of its own next the older building, or has an independent one: this latter is called a counter wall, and is frequently erected without any sufficient space between it and the older wall, and without any provision of a cover to that space which will inevitably occur at some time, and will admit rain-water, dirt,

etc., that obtain sufficient power by various causes to make one or both walls cope over, or even to break them. In France the *contre-mur* was also the back, as it would now be called, built against the wall of a fire-place, or under the manger of a stable, or round manure yards, or between wells and cesspools. 5.

**COUNTESS.** The name given to slates 18 ins. long and 10 ins. wide, a ton of which will cover about three squares of roofing, or a thousand slates about six squares. There is also a larger sized countess slate about 20 ins. by 10 ins., a thousand of which cover about seven squares and a half. 1.

**COUNTRY HOUSE,** see VILLA.

**COUNTY COURT,** see COURT.

**COUNTY HALL** or **COUNTY ROOMS.** The building erected by order of the magistrates for the general convenience of the freeholders of a county. It generally consists of a large room for political and festive meetings: one part being used as a hustings, serves sometimes for an orchestra; the use of the room for exhibitions is also occasionally granted. The hall itself, therefore, should be constructed with a view to such purposes. A housekeeper's residence is generally attached. Because the hall makes a large waiting room, it is frequently accompanied by the civil and criminal courts for the county, with all their appurtenances, and then there should always be a large room for the grand jury, which may be used for the petty sessions or other meetings of the magistracy; also a room for the clerk of the indictments; and the public offices of the clerk of the peace, consisting of at least three rooms and a record room; LONDON, *Arch. Mag.*, 8vo., London, 1837, p. 146. COURT.

**COUPLE** or **COUPLE CLOSE.** A term used in the north of England for a pair of rafters framed together with a tie fixed at their feet, or with a collar-beam. **BARGE-COUPLE.** The main couples answer to the trusses in other roofs. 1. 2. 23.

**COUPLED.** An old mode of writing cupoled, *i. e.* domed; thus SANDYS, *Travels*, fol., London, 1615, p. 26, speaks of Turkish mausolea 'coupled at the top'. 19.

**COUPLED COLUMN,** see ACCOUPLEMENT.

**COURED.** The native name for the wood of the AVICENNIA. 71.

**COURONNE** or **CAP COURONNE.** The name of a calcareous stone employed at Marseilles, and so called from the locality to which the quarries belong. BRAND, *Mineralogie*, 8vo., Paris, 1821, ii, 17.

**COURSE,** see INSTRUCTION.

**COURSE** (Lat. *cursus*; Fr. *cours d'assises*). Any horizontal range of bricks, stones, etc., placed according to some rule in the construction of a building. It is sometimes merely described by numbers, as first course, second course, etc. The courses in construction are *footing* courses; **BOND** courses which contain the iron hoop or wood bond, or which have every stone throughout the range, or at regular intervals, forming bond stones; or which are used to tie together rubble or flint walls, in which latter case they are called *lacing* courses; *springing* courses, from which arches spring; and *check* courses, such as the row of slates or of material laid in cement, placed above footings to check the rise of damp in walls. The disposition of the material also gives different names, as *heading* course, in which the stones or bricks are all headers; and *stretching* course, where the contrary is the case: *random* course is a word much used in **RAG STONE WORK**, that is where the material is of different heights, and the work is only occasionally brought to level beds. Courses used as decoration also have different names, as *base* or *plinth* course, *string* course, *blocking* course: sometimes a course may be in several of these conditions at once; thus a twelfth course may be a heading, bond, string, and springing course. The rows of voussoirs of arches placed behind one another are sometimes called courses, as are the rows or ranges of slates, tiles, etc., in roofs. HACKING. A. A.

**COURSEULLES STONE.** A stone quarried to some extent in the neighbourhood of the little port of Courseulles, to the north-west of Caen, in the department of the Calvados,



in France, and obtained from a member of the upper oolite, supposed by the English geologists to be analogous to the formation known by them as 'cornbrash'. The Creully, Ranville, and Fontaine Henri stones, are obtained from the same geological formation. The beds are exposed in the most distinct manner in the Ranville quarries; and as the stone obtained from them is the one most generally known as the representative of the series, the detailed description of the formation will be given under RANVILLE. It may suffice here to remark that the Courseulles stone is harder, less hygrometric, and denser than the subjacent stone of the great oolite or Caen stone series; it is, moreover, of a coarser grain and of a disagreeable brownish-red colour, besides being irregular in its texture. Great care is therefore required in its selection; but when this stone is of uniform character, *i.e.* free from argillaceous and arenaceous veins, it is well adapted for hydraulic works, or for the parts of buildings exposed to the effects of water. The port of Courseulles itself is built of this stone, which is nearly a pure carbonate of lime; its specific gravity is about 2.07; the load it is estimated to bear is about 1300 lbs. on the superficial inch. CAEN STONE; CALVADOS. G. R. B.

COURSING JOINT. The joint representing the bed formed between two courses. 1. 2.

COURT (It. *corte*, *cortile*; Sp. *atrio*, *corte*, *patio*; Fr. *cours*, but at present *cour*; Ger. *hof*; from the Latin *cohors*, originally *cors*, *cortis*). The yard of a farm, which was double in large establishments; NONIUS, as cited by VARRO, *R. R.*, i, 13, who says the inner one should have a pond and fountain, where the oxen relieved from the plough might drink, as also the geese, sows, and pigs, when they return from being fed: the outer one he describes partly as a straw-yard, "operta stramentis et palea"; and partly as occupied by dung-hills, which he says should be divided into two portions, the older and the more recent. As late as MARTIAL, *Ep.*, xi, 52, the word was spelt *chors*. The English word is now scarcely ever employed in this strict sense of the term for a farm-yard, or wrongly for a stable-yard, or for the kennel-yard; but it is generally applied to any open space attached to a building, and wholly or partially enclosed by the building and its dependencies, or even by a wall or fence. A. A.

The single or double enclosed open area of the ancient *villa* has been a fundamental feature of domestic edifices; it appeared under the name of the bailey in a mediæval castle, of the bawn in the Irish plantations, and it has remained a means of security for the persons and chattels of retainers and dependents, whether in the country or in the city. The courts of the château, of the monastery, of the Hanseatic or other merchant-houses, and of the hôtel, are the courts of the Eastern palace, mosque, caravanserai, and private house. The court has hardly ever lost its character of an enclosure for safety, except in palaces abroad, and in English mansions where at a remarkably early period it served for pomp rather than for defence.

The remains of our large houses of all periods show either a central court, or a building with wings which should define the position of a fore court and back court. In some cases, even, a double fore court exists, and then an ANTE-COURT (the It. and Sp. *ante corte*; Fr. *avant-cour*, *ante cour*; Ger. *vorhof*) precedes the principal court (the Sp. *patio principal*; Fr. *cour d'honneur*). BACON, *Essays*, s. v., expressly prescribes that "you must have, before you come to the front, three courts: a green court plain, with a wall about it; a second court of the same, but more garnished with little turrets or other embellishments, upon the wall; and a third court, to make a square with the front, but not to be built, nor yet enclosed with a naked wall, but enclosed with terraces leaded aloft, and fairly garnished on the three sides; and cloistered on the inside with pillars, and not with arches below." The first court was then called the BASE COURT, but there might be two base courts to one building, one being in front, and the other behind: this term also serves for a court on the side of a building, forming

the approach to a private entrance. The central court, which was formerly a handsome cortile, or even a spacious quadrangle, like those in the colleges at Cambridge and at Oxford, has dropped in the scale of decoration, and has frequently far less dignity than that of Somerset House; the term is degraded by using it for well holes that appear intended to afford light and air. GOUEN, *Antiquities*, 4to., London, 1773, i, 8, says that some of the smaller keeps had not even the convenience of windows, "but were lighted by a small perforation in the top, or skylight, called courts." It is not very difficult to conceive why a narrow street enclosed by houses should be called a court; most of these offences against modern sanitary regulations, were actually the courts of mansions, some few of which remain in London, while more are to be seen in all but the oldest part of Paris.

In England, and as above excepted, the court was retained as an enclosure for the reception of cavalcades, attendants, and the class of persons that used to be called courtiers. The Eastern practice of distributing justice and patronage at the gate, and the consequent attendance of suitors, has been so paralleled till the present day in Europe, that the subject who expected the appearance of Saul or of Ahasuerus; the client who lounged in the cavedium, or still lounges in the cortile, of an Italian patron; the litigant who expected the decision of the mediæval judge sitting in the church porch; and the suitor who waited in the *salle des pas perdus*, or in Westminster Hall, was actually at the gates of the courts; indeed the popular name for a tribunal may be derived from the court-yard, in which until modern times so many trials have been decided *en cour plénière*, and not from the technical Latin *curia*. At all events the word, which is still employed for an open space, is also used in most European languages for the palace of the sovereign, and for a room in which justice is administered. It is only in this last sense that further attention will be herein devoted to the term.

COURT, COURT-HOUSE, COURT-ROOM. There is a difference between these three words, yet their meaning is virtually the same, the place where a tribunal sits. The court-room of such a corporation as the East India Company, and the council chamber of the City of London, are in effect the same thing in their nature, the board-room of the corporation. 'Court-house sufficiently expresses to the populace that it is the place where one of the inferior courts is held; and this is generally what is called 'a court not of record'; such are the places where the courts of manors used to be held, and hence arises the addition of the word 'court' to the name of several old residences: thus NORDEN, *Surveyor's Dialogue*, 4to., London, 1607, ii, says "manor-houses were also, and yet are called in some places, halls, as in Essex, and northward; courts and court-houses westward, as in Somerset, Devon, etc., as also manor-places, all which are places of the lord's own abode." The titles of the *courts of record*, or superior tribunals, which enrol their acts for perpetual memory and testimony, and have power to fine and imprison, will generally be found in any recent glossary of legal words; they are usually classed as courts of general jurisdiction (common law and equity), the ecclesiastical, military, and maritime courts, and courts of special jurisdiction, but some of these latter, such as the commissions under the great seal, are usually called only court-houses.

The accommodation necessary in all these superior courts is generally similar. Besides the raised bench for the judges there will be the lower bench for the assessor, clerk, or other officers. The bench usually requires a canopy, which is sometimes supported by a back and sides, so as to form a passage behind. Between the bench and the bar, on the sides, are the jury box or boxes if any be required, and the witness box, with seats for the ushers: behind the witness box, but separated by a passage from it, is the box usually appropriated to reporters. These accommodations form three sides of a rectangular space



DEY'S PALACE  
ALGIERS





COURT.

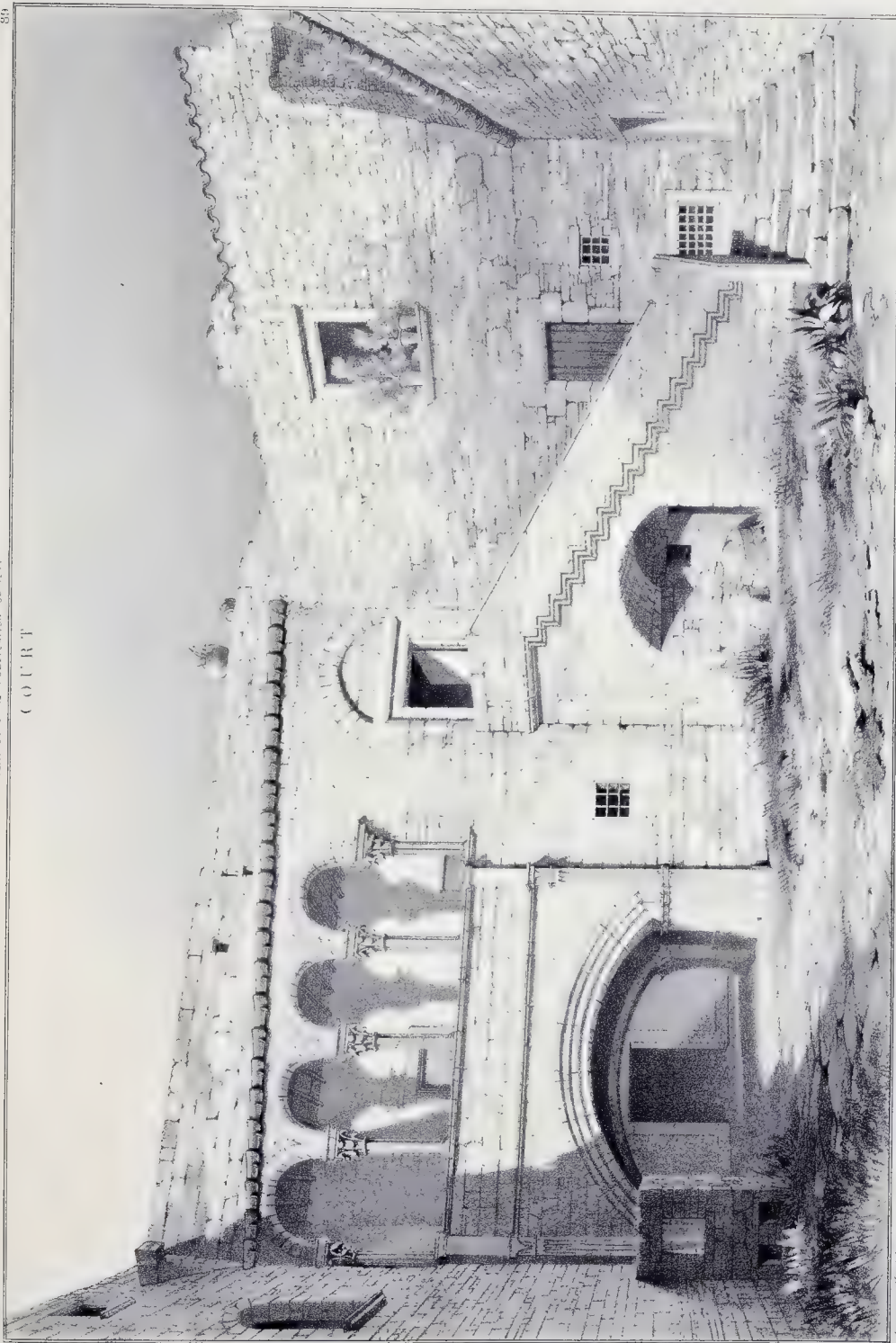


HOUSE OF THE PROVINCIAL ASSEMBLY.  
BARCELONA.





COURT



QUADRANGLE OF HOUSE IN THE VILLA MALATESTA  
SYRACUSE

Engraved by H. J. ...





with seats at the margin having a table in the centre: a passage way across the court divides the actual tribunal from the bar, in the centre of which bar is the dock if any place for a prisoner be required. The bar forms the fourth side of this rectangle, and faces the bench; the seats for the senior counsel are within it, the attorneys being in front; and the junior counsel outside the bar, behind them. The public occupy the remainder of the space in the rear, over which are frequently galleries for the same purpose. Private and robing rooms for the magistrates, and other conveniences, inclusive of ready access to the exterior from the bench, should be carefully provided. A commodious jury box does not seem to have been as yet designed, and to this should be added a retiring room, etc.: a couple at least of similar rooms for the counsel and attorneys; and a couple for suitors and witnesses, with the needful accommodations, are almost essential; to these is frequently substituted, or sometimes by chance added, a small vestibule opening into a large waiting hall or saloon. The number of entrances into the vestibule can hardly be too numerous, as it may advantageously surround the whole of the building. It is indispensable that noise on the outside should be as little audible within, as possible. In criminal courts always, and indeed in civil courts, there should be cells for prisoners. Courts should never be attached to prisons, but if they are contiguous, it will be found very convenient to bring the prisoners into court by an underground passage and staircase rising into the dock, instead of exposing them either to the chance of rescue or perhaps of ill usage by the populace. The usual mode of placing the judge in a strong light is very objectionable. Where the civil and criminal courts are in the same building each should have its consultation room in addition to the above, and there should be a passage for counsel and attorneys from one court to the other.

## COUNTY HALL.

COURTONNE (JEAN), *architecte du roi*, became in 1728 a member of the Academy of Architecture in Paris, where he succeeded 1730 to J. Bruant as professor. According to BLONDEL, *Arch. Fran.*, fol., Paris, 1752, ii, 56, he had built 1707, for the Carthusians, the hôtel, afterwards called de Vendôme and de Chaulnes, in the rue d'Enfer, which is engraved, as it was decorated by Le Blond, in D'AVILIER, *Cours*, 4to., Paris, 1760, pl. 63, D, E, F, G, p. 213; in 1721 the hôtel de Matignon, afterwards called de Tingry, de Montmorency, de Torigny, de Valentinois, and de Monaco, in the rue de Varennes; and 1724 the hôtel de Tremoille, de Noirmontiers or de Sens, in the rue de Grenelle; these two last works are given in the *Arch. Fran.*, i, 217, 224; and with two other designs by Courtonne in BRISSEUX, *Arch. Moderne*, 4to., Paris, 1728, pl. 131-144. He published a *Traité de la Perspective*, etc., containing several designs, fol., Paris, 1710 and 1725. He died 1738, aged sixty-eight years. TICOZZI, supplement to the *Dizionario*, 8vo., Milan, 1833, has transferred the general facts of the above notes to the life of Coustou. 83.

COUSE (KENTON), who was clerk of the works at the Mews, Charing Cross, in 1762, held in 1787 the office of examining clerk in the Office of the Board of Works. He designed for Sir Joseph Mawbey, bart., the house called Botley, near Chertsey, Surrey, given in WOOLFE and GANDON, *Vit. Brit.*, fol., London, 1767-71, ii, pl. 56-7; the church of S. Paul on Clapham Common, 1774-6, which cost about £11,000; and also the bridge at Richmond, Surrey, at a cost of £30,000. He died 10 October 1790, aged 70, and was buried at Lambeth.

COUSERANS or CONSERANS, see LIZIER (SAINT).

COUSTEAU or COUSTOU (CHARLES PIERRE), son of a sculptor, the elder Guillaume, was elected a member of the Academy of Architecture at Paris in 1762, became *architecte du roi*, inspector of public buildings, chevalier of the order of S. Michael, and died 1802. 45, 68.

COUTABALLI WOOD. A very fine, close grained, hard, heavy wood from the river Demerara, British Guiana. It is durable if not exposed to the weather, and being plentiful it is

principally used for house frames. The wood will square 12 ins. for a length of 30 to 40 ft. 71.

COUTANCES or COSTANCE (Latin Constantia). A city, formerly the capital of the Cotentin, in the department of la Manche in France. On the west side is a valley crossed by an ancient aqueduct, consisting of five perfect arches and fifteen piers. The cathedral, dedicated to the Virgin, is one of the finest churches in Normandy. Its style is *ogival primitif*, which is evident in the choir, apse, and transepts; some of the capitals of the five-ailed nave indicate the period as the end of the twelfth century; the style *ogival secondaire* appears in the lady chapel and in the aisle chapels, which are separated from each other at 10 ft. from the ground by mullioned openings: there is some good stained glass; BOURASSÉ, *Cathédrales*, 4to., Tours, 1843. Of the two parish churches only that of S. Pierre need be named, it dates from the fifteenth century: a nunnery, four educational establishments, a theatre, and a prison, are the other chief edifices. VIOLET LE DUC, *Diet.*, s. v. Cathédrale, p. 361, gives a plan, etc., of the cathedral; and LA BORDE, *Mons.*, fol., Paris, 1816, ii, 176, gives a view. 50, 96.

COUTURE (GUILLAUME), born at Rouen 1732, went at an early age to Paris, where he erected the hôtels de Saxe and de Coislin; and the pavillon de Bellevue at Sèvres. In 1773 he was elected into the Academy of Architecture. He then studied in Italy, and on his return was commissioned to continue the Madeleine, after the death of Contant, 1777, who since its commencement, 1764, had only carried the work to 15 ft. above ground. The design was so much altered by Couture, who made fresh foundations, especially for an octastyle portico of his own invention facing the rue Royale, that his pupil Beaumont, with Montaiglon, published under the name of Contant's son-in-law Dulin, a *Lettre* (now rare because suppressed by the government) containing the plans of the three artists: the work had advanced as far as the completion of the columns when the works were stopped by the Revolution; after 1808 the building was again altered to its present design. The alterations of the palais de justice, and of the buildings in front of it, were the work of a committee composed of Moreau, Desmaisons, Couture, and Antoine. He became 1788 chevalier of the order of S. Michael, and died 29 December 1799. 83.

COUVILLIER and COUVILLIES, see CUVILLIER (FRANÇOIS DE).

COVA (JACOPO) of Bruges, who had established himself at Paris, was summoned 1399 to Milan, for the purpose of giving his opinion on the building of the cathedral. GIULINI, *Mémoire*, 4to., Milan, 1771, xi, 456.

COVARRUBIAS DE LEIVA (ALONSO DE), also called CAVARRUBIAS, COBARRUBIAS, COVARUBIAS, and COVARRUVIAS, born at Cobarrubias or Covarrubias, in the province of Soria in Old Castile, was a pupil of Simon de Colonia at Burgos, and afterwards of Anequin de Egas at Toledo. Alonso became *maestro-mayor* to the cathedral there 15 October 1534; in 1512 he was one of the nine architects examined upon the design for the cathedral at Salamanca; he had previously been deputed to report with Diego de Siloe on the *capilla mayor*, commenced 1498 by Juan de Alava, for the cathedral at Plasencia; and 1524, with three others, to report on the works and decide the details of the cathedral at Salamanca; he was resident at Guadalajara 1527-29, when he supported Juan de Alava's opinion of the work by Juan Gil de Hontanón at the cathedral in Segovia, against the criticisms of Egas and Vigaray, and 1530, when his design for the *capilla de los reyes nuevos* to the cathedral at Toledo was preferred to Siloe's. It should be noticed that the competitors and Pedro de Machuca appear to have introduced, if not invented, the style *de la Renaissance* in Spain; the latest works of their masters scarcely exhibit it. Alonso was sent 1531 to Valladolid to obtain the royal approval of the award, and completed, 1534, the structure which was executed by Alonso Monegro. Among the consequent com-



which if used were sometimes quite independent of the other timbers, being simply notched down and pinned (in France they are generally dovetailed) to the wall-plates. Sometimes the rafters were only connected by diagonal braces; these occur where the space is small, as over a porch, as A. For wider spans each pair of rafters was framed with a collar beam, and further stiffened by braces crossing at times above the collar, B, and at others being tenoned into the under side; when the latter was the case a second collar or wind-beam was generally introduced above the first, C. The timbers were often left exposed, but they were frequently boarded underneath, forming a polygonal barrel vaulting, with molded ribs applied to form panels, the intersections being covered with carved bosses. A perfect barrel shape was obtained by the employment of curved braces framed into the angles of the trusses formed by the intersection of the different timbers, as in the chancel of Solihul church, Warwickshire, where the timbers are left quite plain. This principle has been applied to spans of 31 ft., as at Reedham church, Norfolk, and the nave of Ely is covered by a roof of similar construction. VIOLLET LE DUC, *Dict.*, s. v. *Charpente*, iii, 33, illustrates a very fine example, D, covering the great hall of the château of Sully sur Loire (end of fourteenth century), which is about 89 ft. span; the wall plates are as usual double framed, and from the external one the rafters rise at a very acute pitch; into these are framed two collar beams, the lower one fixed somewhat more than half way up the roof from the wall plates; between the collar beams two longitudinal timbers run the whole length of the roof, connected together with cross struts, which prevent the trusses from rocking or leaning over sideways. From the floor, springs a curved piece connected with the foot of the rafter above the wall plates, and framed into the rafter where this piece becomes tangential to it; another curved piece rises from above the first, finishing at the upper extremity under the lowest of the above named longitudinal timbers. The roof to the church of S. Jean at Chalons-sur-Marne, as E, is nearly 20 ft. span, and has a tie-beam and king-post, the upper end carrying a longitudinal ridge-piece stiffened with braces which spring from the king-post just above the intersection of the cross braces with which all the rafters are connected; each pair is also

further strengthened by curved pieces of timber, the upper ones uniting the rafters with the cross braces, the lower ones bringing down the line of the arch formed by these curved pieces to the inner face of the wall, and connected with the bottom of each rafter by a cross piece, which may be called a wall-beam, thus forming a foot for the roof the whole thickness of the wall. The feet formed by these wall-beams connected with the rafters by struts, perform a very important duty in all mediæval roofs, and are the germ of the HAMMER BEAM introduced in a later principle of roofing. BRANDON, *Open Timber Roofs*, 4to., Lond., 1849; *Analysis*, 4to., 1847; and *Parish Churches*, 8vo., 1848-51, illustrate some good English examples. R. B.

**CRADLE VAULT.** A term improperly used to designate a cylindrical, otherwise called a barrel, vault. 1.

**CRADLING.** The wooden ribs and pieces prepared for the reception of the lathing and plastering that are to form false vaulted ceilings, imitation arches, etc.; such cradling is said to be DISHED OUT. **BRACKETING.** These ribs or brackets were called compass spretchets. 41.

The same term is applied to the wooden bracketing for carrying the entablature of a shop front. 1.

**CRAIG (JAMES)** designed the first built portion of the new town of Edinburgh in Scotland, comprising Princes-street,

George-street, and the cross streets between these and S. Andrews and Charlotte squares. He also designed the physicians' hall, now destroyed, and some other buildings in that city. He died 1795. C. G. H. K.

**CRAIGLEITH STONE** The quarries from which this stone is obtained are situated a short distance from Edinburgh in Scotland, near the shores of the river Forth, which has lately inundated them. The stone is a member of the sandstone formation, which immediately underlies the mountain limestone of the carboniferous series near the city. In this particular instance the original bedding of the stone appears to have been effaced by the intrusion of the trap and basaltic rocks which come to the surface at Arthur's Seat and Salisbury Crag, and have caused the constituent particles of the sandstone to assume a rude crystallization. The best beds are at some distance from the surface; the quarry is worked to a great depth in stages, open to the sky; and the stone is procurable of any practicable length and breadth from 6 ins. to 10 ft. thick. In the *Report* of the Commissioners upon Building Stones the specific gravity of the Craigleith stone is stated to be 2.266; and it is usually estimated to be able to resist a crushing weight of 5,800 lbs. per inch superficial. The colour in the best beds is a very pale grey, approaching white. It is nearly a pure siliceous sandstone with small plates of mica interspersed, and resists atmospheric action remarkably well, but is objectionable on account of its hardness, and the consequent cost of labour, and of the black stains on the surface after exposure.

No doubt the change which has taken place in the molecular arrangement of this sandstone, through the introduction of the trap rock, may be considered to explain the asserted peculiarity of its resisting the ordinary causes of decomposition when placed without reference to its natural bedding. The same phenomenon occurs in the clay slate rocks; and in these the planes of cleavage, according to which they split and decompose with the greatest readiness, are often markedly different from the planes of stratification. Both these instances, however, are only local exceptions to the ordinary laws of the resistance of building stones, and they cannot be considered to invalidate the general rule for the necessity of attending to the bedding of that class of materials. **BED. CRUSHING WEIGHT.**

This stone is used extensively in the public buildings and streets of the new part of Edinburgh, as at the college 1580, the register office 1774, courts of law, all which appear in a perfect state. It is supposed to have been first used in London for the staircases at the custom house, at the new post office, the British Museum, paving of S. Luke's church, Chelsea, S. Thomas's hospital, and was employed (1838-9) in the repairs of Blackfriars bridge. The 'Liver' rock is said to be of the same strength as the 'Bed' rock, but being of a finer grain is better calculated for carving. G. R. B.

**CRAIGNAIR.** A quarry of grey granite close to Buittle bridge, on the river Urr, Kirkcudbright county, Scotland, and rather more than a mile from a quay on the same river, whence it was shipped to Liverpool for the docks, in which a large quantity of this stone was used some years since. W. R. C.

**CRAIL WORK.** A term applied to ornamental work in iron, as explained s. v. **BALCONY.**

**CRAMP, or CRAMPERN;** abbreviations of *CRAMP IRON* (It. *chiave*, *rampone*, *arpece*; the cramp hole, *buco*; Sp. *clavo*, *laña*; Fr. *crampon*, *goujon*, *ancree*; Ger. *klammer*). In masonry this word is applied to a piece of hard material inserted in a stone to connect it with any solid body to which such stone is to be attached. Cramps are made of lead as well as of iron; but copper, gun metal, or slate ought only to be employed. They are either simple pieces turned down at the ends, thus —, or they are uniform in thickness, but dovetailed in plan, ⊞. They are usually run with lead, except in marble work, with which plaster is used; but old French writers energetically recommended sulphur. Portland cement is now occasionally employed.

The most important observation to be made with respect to cramps is, that the use of iron should be avoided when the thickness of the stone is not sufficient to prevent the passage of water from the exterior to the metal, because the formation of hydrous oxide, which takes place when water reaches the cramp, causes the metal to exfoliate, and occupy a larger space, and hence 'flushes' or 'blows' the stone. Sir C. Wren observed that no iron cramp should be fixed nearer than 9 ins. to the surface. When greater strength is required in a course of masonry than detached cramps will give, it is usual to employ a CHAIN, or else a bar with dogs, dropped into a cavity in the body of the work. G. R. B.

Copper cramps are best for stone work, especially when exposed to the air. Cast iron cramps are far less subject to decay by oxidation than those of wrought iron. The Egyptians used wooden cramps; the Propylæa at Eleusis had plugs and cramps of brass, while that at Athens had iron; DILETTANTI SOCIETY, *Unedited Antiq.*, fol., London, 1817, p. 10. A collection of cramps for various purposes is given in INWOOD, *Erechtheion*, fol., London, 1827, pl. 14, 20, pp. 118, 125. Professor COCKERELL has given in the sup. volume to STUART, *Antiquities*, fol., London, 1830, some interesting details of the manner adopted in cramping the stones of the temple of the Giants at Agrigentum.

A vertical cramp is termed a DOWEL and a PLUG. AGRAFE or AGRAFFE. ANSA. CHAIN COURSE.

CRAMP is also the term now given to the instruments used by joiners and others for forcing together straight joint floors, and for holding together pieces of wood, but CLAMP is the original word.

CRAMPONS. Hooked pieces of iron resembling double calipers, and used for raising timber or stones. 1, 2, 4.

CRANE. A machine employed for raising and lowering heavy weights. Illustrations will be found in HEBERT, *Encyc.*, 8vo., Lond., 1836, and CRESY, *Encyc.*, 8vo., Lond., 1856. DERRICK.

CRANK (It. *manivella*; Sp. *manubrio*, *ciqueñal*; Fr. *manivelle*; Ger. *Kurbel*). A rigid arm fixed at one extremity upon a shaft perpendicular to its own axis, and receiving at the other an alternative impulse. It is the most usually adopted method of converting alternate circular or rectilinear motions into continuous circular motions; and for this purpose the crank requires to be connected with the first mover by a cord or by a rigid rod. It is used in buildings for the purpose of changing the direction of bell wires, and then usually called a bell-crank. G. R. B.

CRANMORE STONE. This stone, obtained from quarries near Douling in Wiltshire, is composed of carbonate of lime with a few oolitic grains and an abundance of small shells commonly in fragments, often crystalline. It is of a light brown colour, and obtained of large size; the thickest beds will work twenty inches. The churches and chapel at Glastonbury Abbey (Norman, 11th, 14th, and 15th centuries) are probably of this stone, and are generally in good condition; while the upper part of the tower of Wells cathedral (14th century) is generally decomposed, but not to any great extent. COMMISSIONERS' REPORT ON BUILDING STONES.

CRAPAUDINE DOOR. The name formerly given to a door which turned on top and bottom pivots, because the French word *crapaudine* meant a cube of iron or bronze hollowed on one side to receive a pivot or gudgeon. 1, 2, 5.

CRATE OF GLASS. The skeleton or grated box in which glass is packed at the factory and kept in stock. CROWN-GLASS.

CRAWBANK STONE, obtained from a quarry at Borrowstownness, Linlithgowshire, is of a light ferruginous brown colour, and composed of fine quartzose grains with an argillio-siliceous cement, somewhat ferruginous, with disseminated mica. Blocks are procurable in sizes of 5 ft. thick, 6 ft. wide, and 10 ft. long. A Roman bridge dating 140, and the old church of Kinneil, of the 12th century, are erected of this stone. COMMISSIONERS' REPORT ON BUILDING STONES.

CRAW BED. The upper bed of stone in delph quarries, Yorkshire. W. R. C.

CRAYON. A French name derived from *craie*, chalk, for certain drawing materials, that are of two kinds, natural and artificial. The principal native crayons are the white, the red, and the black. The best white is a chalk found in France, which is brilliant unless it has been cooked in some manner to mitigate its brittleness. The substitute, pipeclay, has a very inferior tint. Red chalk has often been employed because it is freer than the best black, and firmer as well as smoother than other sorts of the black chalk; but it does not allow the same amount of finish in a drawing. Artificial crayons are composed of different coloured earths and other pigments rolled into solid sticks with some tenacious medium. The best artificial black crayons are those made under the process invented 1795, at Paris, by Conté. 14, 40.

CREAM YELLOW. The name given to a colour consisting of pale yellow with a little red and a very little brown, for which lithomarge is proposed as a standard by ANSTED, *Course*, 8vo., London, 1850.

CREASING. This is of two sorts, single and double. Single tile creasing consists of a row of plain tiles placed horizontally under the brick on edge coping course of a wall, and projecting about 2 ins. to throw off the rain water. The term is also applied to slates or metal so employed either in a similar situation, or for a similar purpose, as over set-offs, string-courses, etc.; even the tops of rusticated quoins were protected in this manner, as may be seen in the fronts of the houses said to have been designed by Lord Burlington in Savile Row and its neighbourhood, in London. In double tile creasing, two rows of tiles generally worked in cement break joint. CREST.

CREASOTE, generally improperly written creasote. The name derived from the Greek *κρέας*, "flesh", and *σώζω*, "I save", for an oily liquid obtained from crude pyrolygneous acid. It is colourless, transparent, and bitter; has a strong, persistent smell, and a caustic action upon the skin. LIEBIG states that the creasote of commerce consists of 75.56 carbon, 7.78 hydrogen, and 16.66 of oxygen. It possesses the power of coagulating albumen; and for this reason, as also on account of the immunity it ensures from the attacks of ants or boring worms, it is much used for the purpose of preserving timber. When creasoting is properly executed, as much as 7 lbs. of the liquid is injected into every cubic foot of the wood after the natural moisture has been extracted. BETHELL'S PATENT, etc. G. R. B.

CREDENCE or CREDENCE TABLE (late Latin, *credentia*; It. *credenza*, *credenziera*; Sp. *credenzia*; Fr. *credence* or *autel de credence*; Ger. *credenz-tisch*), also called *oblationalarium*, *paratorium*, *paratrapezon*, and table of *prothesis* by various writers. The word *credenza* appears to have been received at an early period by the Italians as implying something more than its usual meaning of confidence or trust; viz. for the assay made by the taster of the viands in great houses, as correctly noticed in the *BUILDER Journal*, iii, 30, xiv, 452; next for the lower table at which the experiment was performed; or, when the ceremony went out of fashion, for the table on which plate, etc., were kept at hand, and where the dishes were successively placed in readiness for use; and ultimately for the dinner room or apartment, if there were one separate from the dining hall, in which such a buffet or sideboard stood. (SOMMERARD, *Album*, ii, 22; *Atlas*, xxii, 10.) The word *credence* was established in these significations long before it was applied to a table put near one side (north in the modern Greek, south in the Roman, church) of the altar, and formerly serving to receive the offerings of the congregation as well as the wine to be consecrated at high mass, and at present to hold in addition all the utensils required by the priest during service. The term *credence* was then undoubtedly applied, in consequence of a previous tasting or assay; but BURIO, *Onom.*, says with reference to the safeguard of the chalice, etc.; and the word *credence* is thus applied to an ambrey for the vestments at S. Clemente in Rome and at Seville cathedral. The time of the introduction of the credence table, also called in the Roman Catholic church



from a mere inspection of a stone, from what precise locality it has been obtained. Thus it would be impossible to recognize any difference between the Creully and the Fontaine Henri stones, or to say from which precise portion of the series the stone used in erecting Bayeux cathedral was obtained. The Creully quarries furnish, however, the material most esteemed by local builders; and which with the Fontaine Henri stone, is more regular in texture and colour than that of Courseulles or of Ranville. The long land carriage, however, limits the use of Creully stone to the immediate locality in which it is found. CAEN, CALVADOS, COURSEULLES, and RANVILLE, STONE.

G. R. B.

CREVOLA MARBLE was used for the monolithic shafts, 4 ft. in diameter, of the columns to the *arco della pace* at Milan by Cagnola, 1807-36. It is worth inquiry whether this is the same as the 'white marble with leaden veins, only fit for making lime', which is obtained at the village of Crevola near Duomo d'Ossola, in the Sardinian States, according to DI RAMBOLDI, *Corografia*, 8vo., Milan, 1832.

26.

CREW-YARD. The name given on farms in the north of England for the fold-yard or general yard for horses, cattle, and pigs. It should be well drained, covered with straw, having a shed for shelter, and is sometimes fitted up with feeding troughs. Where the farmer keeps his varieties of stock separated, a crew-yard is divided by hurdles, fences, or walls, or else there are two or more contiguous yards; in both cases swing doors allow pigs to pass from one to the other. A. H. M.

CRIBWORK. A term used in the United States of America for work "formed of large blocks of granite filled in with earth and rubbish", as quay walls, etc.

CRICHTON (ALEXANDER OF) was in 1451 master of the works of the royal castle of Kildrummy in Scotland; BUILDER *Journal*, ix, 53.

CRICHTON (RICHARD), of Edinburgh, remodeled Lawers in Perthshire, for David R. W. Ewart, built 1738 by William Adams; and Balbirnie house in Fifeshire, for Major-General Balfour; designed about the end of the last century, Dunglass in Haddingtonshire, for Sir James Hall, bart., author of *Essay on the Origin, etc., of Gothic Architecture*, 4to., 1813; at the beginning of this century Gask in Perthshire, for Laurence Oliphant; Abercainy abbey in the last named county, for James Moray (finished by the Messrs. Dickson); and Rossie castle in Forfarshire, for Hercules Ross: all these edifices are given in NEALE, *Views*, 4to., London, 1823, vi.

CRIMSON (Fr. *laque rose*). A variety of red for which it is difficult to find a standard: deep crimson is compared to the colour of the ruby and of cobalt bloom, by ANSTED, *Course*, 8vo., London, 1850.

CRIMSON LAKE. A pigment made from the refuse COCHINEAL used for CARMINE.

CRIPPLINGS. A word explained in PHILLIPS, *World of Words*, fol., London, 1678, and COLES, *Dict.*, 12mo., London, 1732, as "short spars on the side of a house", copying from the "tigna brevia latera ædium" of SKINNER, *Etymol.*, fol., London, 1671.

CRIPPLE WINDOW. A term used at Leeds in Yorkshire for a window in the sloping part of a roof, usually called a DORMER.

W. R. C.

CRISTOBAL (PEDRO) is called "Petrus Christophorus magister hujus operis" in an inscription dated 1170 (1182) in the church of the Premonstratensian monastery of S. Cristobal de Ibeas, near Cardena, in Spain.

66.

CRISTOBOLO, see CHRISTODOULOS.

CRISTOFANO, see SANESE (CRISTOFANO DI FRANCESCO). CRISTOVAL DE HABANA (SAN), commonly called Havanna. A city in the island of Cuba. The houses generally have only one story, but are of very solid construction; the windows are not glazed. The cathedral, eleven other churches, the residence of the captain-general near the citadel, the naval arsenal, the post office, two hospitals, the great tobacco-factories,

the university, the *seminario*, the theatre, and the three gates, are more remarkable for solidity than elegance.

96.

CRISTOVAL DE LAGUNA (SAN). A city in the island of Tenerife. The houses are very old, and solidly built: there is a handsome *place*, and two churches, one of which, dedicated to the Nativity of the Virgin, was made cathedral 1824, when a small episcopal residence was provided. Three monasteries, two convents, and an hospital, are the chief other buildings, as the seat of government has been transferred to Sta. Croce.

96.

CRISTOVAL DE LOS LLANOS (SAN). The capital of the state of Chiapa in Mexico. It was founded 1528, and has a cathedral dedicated to S. Cristoforo, three monasteries, a nunnery, a *seminario*, and an hospital.

96.

CROBBET, see CROC.

CROCE (FRANCESCO) was appointed 25 April 1760 architect to the duomo at Milan, and finished 1772 the spirelet terminating the central octagonal portion above the roof.

27.

CROCE (GUIDOLO DELLA) was consulted 26 March 1701 on the works proposed by Jean Mignot to the cathedral at Milan. His opinion, a curious proof of the merits of Johan von Fernach and Heinrich von Gmünden, is given in GUILINI, *Memorie*, 4to., Milan, 1760, xi, 452, 458.

27.

CROCKET, originally CROCHET or CROCHETE, sometimes written *croquet*, and also called *creeper* (It. *uncinetto*; Fr. *chou rampant*, *crochet*, *crosse*, *fleuron*; Ger. *hüklein*, *knollen*, *krabben*). The small ornament, generally a bud, flower, leaf, or bunch of foliage, used in mediæval work to decorate the external edges of gables, gablets, canopies, hood molds, spires, pinnacles, etc.; the larger bunches at the top, standing upon an upright stem (the finial), are properly called crops, although till lately included in the general term FINIAL. In a few instances, animals and figures are thus employed, as in Henry VII's chapel at Westminster, and the hall at Hampton Court, Kempe's monument at Canterbury, and Bingham's at Salisbury. The crocket is sometimes used among vertical moldings, as in some of the mullions and jamb shafts at Lincoln cathedral, but is never found among horizontal moldings, unless some examples of a CREST may be supposed to exhibit it. Crockets are invariably placed at equal distances apart in suits, but each suit is not always uniform in pattern. The earliest crockets are, as their name imports, hooks or crooks curling back from the work upon which they are set, with little resemblance to foliage: at the church of Than, 1060, and S. Peter at Caen, 1060, in Normandy, they are heads of animals. At the end of the First Pointed style, they appear as small leaves on long stalks, and as bunches of leaves curled backwards; in the Second Pointed, they consist of leaves set singly, or springing from one continuous stalk; and in the Third Pointed, as well as previously, they generally represent a broad leaf with edges attached to the ground-work, and the middle portion and the point raised: sometimes, however, they are formed by square flat leaves united to the ground by the stalk and one edge. The varieties are numerous; some of the fifteenth century are given in the *Illustrations*, s.v.

This system of decoration seems to have been foreshadowed by the classic decorations on pediments, as seen on fictile vases, coins and reliefs, of which a good instance from the Hieron near Epidauros, is given to a large scale by VULLIAMY, *Ex-amples*, fol., London, 1823.

CROCKET AND FRET WORK (PANELS OF). A term used in the descriptions of the churches of S. James, Westminster, and S. Nicholas, Old Fish-street, as well as of the three churches of S. Michael, Bassishaw, College-hill, and Wood-street, built by WREN (*Parentalia*, fol., London, 1750), with regard to the decoration of their ceilings by lines of husks (the crockets) bordering a guilloche (the fret).

CROCKET ARCH. The name given in LANGLEY, *Builders' Director*, 12mo., London, 1751, pl. 168 and 169, to an arch of which the intrados forms three or five foils, as A and B.



CROCKET













**CROCKET WINDOW.** A term in NEVE, *Dict.*, 8vo., London, 1736, s. v. Buttress, who notices amongst the usual situations of a buttress, "the head of stone buildings where there are great crocket windows."

**CROFT.** An Anglo-Saxon word still used for a small field attached to a dwelling-house. It was also employed for a crypt or other arched space, in which sense 'under-croft' is scarcely yet obsolete. CROUDE. 19.

**CROISSETTE**, sometimes written CROSETTE and CROSSETTE. The French term used until late in the eighteenth century in England for "the returns in the corners of door cases or window frames, called also ancones, ears, elbows, and prothyrides"; and for the shoulder of a joggled keystone. 4. 5.

**CROKETTE** and **CROKIT.** Old modes of writing CROCKET. 16.

**CROMLECH**, derived from the Welsh *crom llech*, Irish *crom laac*, bent or crooked stone. A species of Celtic building, consisting, according to LUKIS (paper read 24 February 1853 at the Society of Antiquaries) of "successive dolmens in contact forming one common chamber, with the props erect, raised; the sides closed except at the entrance": a dolmen itself being a large stone entirely supported on two, three, or four others, erect, raised, and smaller; the sides open. Various other names have been given to the cromlech; as (Fr. *cercle, chambre* or *creux des fées, pouquelaye*) Druid's altar, quoit, and witch's stone. An otherwise useful paper, shewing how the term cromlech has been improperly applied to the DOLMEN and to the PERISTALITH or Celtic ring, is given in the *GENTLEMAN'S Magazine*, 1833, vol. 103, i, 12. The true form of a cromlech, a chamber of long triangular area with the only entrance at the apex, is seen in the magnificent examples of Gavr' Innis in the department of Morbihan in Brittany, on the coast of Normandy, and in the Channel Islands. As such sepulchres in Guernsey have their long diameters invariably placed east and west, their cap-stones are laid in an opposite direction, whereas the cist-vaen (the closed chamber consisting of a roof which is supported on several smaller erect stones) has the cap-stone, on the contrary, east and west. Wherever the cromlech or the cist-vaen occur, traces may be expected of the peristalith or enclosure of erect stones, sometimes contiguous, with its western entrance: this formed the nucleus of a tumulus.

Compound cromlechs occur, that are the result of additions. "One mode was by the addition of successive dolmens to the original structure; these are invariably placed to the eastward, and are found in no instance to exceed the limits of the peristalith. But when room was yet further required, it was gained by constructing lateral cists, which were also invariably joined to this newer portion. Sometimes, but rarely, they communicate with the larger lengthened chamber. These remarkable additions are observable in the instructive cromlech Dehus, in Guernsey. Singularly enough, but readily explicable, these additional cists were formed within the chamber itself. In Jersey, a recently discovered cromlech presents five of these enclosed cists. After this period the peristalith was abandoned, and the successive dolmens were continued to a very great length, as in the very perfect example of Gavr' Innis, Morbihan; but even here the succession may be distinctly traced by the transverse-lying blocks. The original structure was a cist covered with one stone, with a floor of the same, and only between 7 and 8 ft. square. The tumulus over this was high and conical; and as the additions were made so did the tumulus follow them, but not raised to the same height as the first." LUKIS adds, "Cromlechs, properly so called, lie in a direction east and west, but if any deviation from this occurs, the direction is found to incline in nearly every instance to the south-east and north-west. But this does not constitute the anomaly: it is found in a structure at first view resembling the cromlech, which, while in the immediate vicinity of cromlechs all lying east and west, does itself lie north and south, or at right angles to the former. But let any one examine such a structure, and

it will pretty constantly present those features which serve to distinguish it at once from the former. For instance, there occurs one of these on the plain of Lancrese in Guernsey, which for some time was conceived to be a cromlech, but when the spade had been freely used, it was found to be a succession of cists with recumbent supports, each cist about 5 ft. square, and separated from its fellow by a rude somewhat rectangular block, extending from side to side, in the manner of those transverse blocks in the cromlech of Gavr' Innis, etc. This remarkable cromlech lies likewise north and south; and similar anomalies could be found, which it would be perceived were neither cromlechs nor cists, but, like the latter, have the sides closed. He rather inclined to the belief that all these were of more recent date, and one fact was remarkable, that much pottery was seldom found in them. In the ordinary compound cists, which are grouped, urns are found in abundance, and besides these in the single cists, some beautiful stone celts, etc. It is not necessary to attach new names to these structures, for upon such trifling differences might new appellations be given to every individual specimen. It is evident that they are but modifications of an original idea which is universal, and as these tombs have different dates of construction, and in a great measure depend upon the nature of the rock and the shape of its blocks, there are necessarily varieties in form, etc." CELTIC BUILDING.

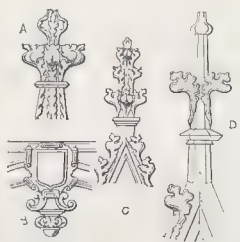
The fosse which surrounded Ressel cromlech, situated near Kington and Bodenham in Herefordshire, is recorded in an Anglo-Saxon charter as the only instance in which the cromlech appears with a local name in any such record seen by WILLIAMS, as mentioned in LEO, *Local Nomenclature*, 12mo., London, 1852. Illustrations are given in STUKELEY, *Itin. Curiosum*, fol., London, 1724; ROWLANDS, *Mona Antiqua*, fol., London, 1766; BORLASE, *Antiquities, etc., of Cornwall*, fol., London, 1769; KING, *Mun. Antiqua*, fol., London, 1799; TOLAND, *History of the Druids*, 8vo., Montrose, 1814; HIGGINS, *Celtic Druids*, 4to., London, 1829; BLIGHT, *Ancient Crosses, etc.*, 4to., London, 1856; ARCHEOLOGICAL INSTITUTE *Journal*, 1844; NODIER and TAYLOR, *Voy. Pitt. (Bretagne)*, fol., Paris, 1845; and GAILHABAUD, *Monuments*, 4to., Paris, 1850, i.

CRONACA (IL), see MASO DEL POLLAIUOLO (SIMONE).

**CROOKHILL STONE**, obtained from a quarry near Doncaster, in Yorkshire, was used in the pillars in rebuilding the church in that town in 1855. It is stated to be very difficult to work on account of its hardness, and is very little used.

**CROP**, formerly written CROBBE and CROPE (Fr. *bouquet*). The Anglo-Saxon word for the top of a tree, etc. "It is the

legitimate term by which the knop of unfolding leaves (A), such as surmounts a purfled pediment or finial in architecture, or forms the head of a sceptre, may be designated" according to WAY, in WILLIS, *Arch. Nom.*, 4to., Cambridge, 1844, p. 66, who also supplies an instance of the use of the word for such a knop reversed and employed as the decoration (B) of the bottom of a



keystone. This term is more correctly applied to a portion (a-b in D) of a finial, than for the finial itself which (as at C) may contain two or more crops.

**CROQUET.** A former way of writing CROCKET.

**CROSETTE**, see CROISSETTE.

**CROSS** (It. *croce*; Sp. *cruz*; Fr. *croix*; Ger. *kreuz*). The name of the emblem of the Christian religion has been applied not only to objects in which the figure ✕ may more or less be found, but to many which have no other claim to the name than that of being in some way or other cruciferal. The use of the cross, not merely in the plan of a church but in the design of the pavements and on flat grave-stones, does not seem to have



been prevalent till the eleventh century; at least it had previously been considered improper to introduce this emblem in any situation where the foot of man might be placed upon it. As an architectural ornament the cross in Anglo-Saxon work was plain and simple, as in S. Peter's at Wearmouth; but it soon assumed a more ornamental character, as on the tower of Barnack church in Northamptonshire. The great variety of designs for the limbs of the cross, as seen in the numerous works which treat of Christian sepulchral memorials, whether flat or upright, may be paralleled by the number of designs for gable-crosses (see *ECCESTIOLOGIST*, v, 16) which may be collected from the works published on mediæval buildings. Few good examples remain even upon the Continent of the rood in its loft, which may be supposed to have existed over the entrance to every choir or chancel; one, however, in S. Fiacre, at Faouet in Bretagne, is given in NODIER and TAYLOR, *Voy. Pitt.*, which work contains other *jubés*. The term cross, as applied to a cruciferous pillar, etc., is also applied to instances where this emblem has an isolated or engaged employment in structures erected by the wayside (Ger. *betsäule*), to suggest the repetition of devotional exercises, or for the same purpose on the site of battles, murders, or accidental deaths. In such cases the erection usually resembles those once standing upon village greens in this country, and generally has a cross placed, with or without the intervention of a sort of capital, upon a shaft on a base or pedestal raised on two or more steps. Remains of such crosses at Clearwell in Gloucestershire, Laycock in Wiltshire, and Newark in Nottinghamshire, may be cited. Of the same kind are some of the landmark crosses, as that on Dundry Hill in Somersetshire: the same description applies to the cemetery or churchyard cross, sometimes called a palm-cross from the distribution thence of branches on Palm Sunday; such as that 15 ft. high from the ground at Somersby in Lincolnshire, Stringston in Somersetshire, Great Bedwin in Wiltshire, Bakewell in Derbyshire, and Higham Ferrers in Northamptonshire. Some of these crosses undoubtedly served as sanctuary crosses, like others that were also meant to mark the boundaries of districts or of estates.

Other crosses may have been simply memorials of an event, such as that on Stainmoor, between Yorkshire and Cumberland, erected in witness of a peace between England and Scotland; and those of which Geddington, Northampton, and Waltham, remain, marking the places where the corpse of Eleanor, queen of Edward I, rested on its journey, 1290, from Lincoln to London; the accounts of expenditure for these were edited for the Roxburgh Club by TURNER, *Manners*, etc., 4to., London, 1841, pref. lxxxiv, pp. 93-145, and are noticed in the *Archæologia*, xxviii. Similar in purpose, if not the boundary crosses of the monastery of S. Denis, were those said to designate the places where Philip the Bold and his brothers rested when they bore, 1270, the corpse of their father from Paris to S. Denis. These memorial crosses sometimes served like the village and market crosses, for pulpits and places of public penance; one erected simply for preaching exists in the grounds formerly belonging to the Black Friars at Hereford. Market crosses carrying or built round a central cross, as at Cheddar in Somersetshire, are vaulted buildings, sometimes square as at Leighton Buzzard in Bedfordshire and at Winchester, but generally polygonal and open at the sides, being large enough to shelter a considerable number of persons, as at Aberdeen, Chichester, Malmesbury, etc.; a good account of them is given in BRITTON, *Arch. Antiq.*, 4to., London, 1807, i. The monolithic cross which is so frequent in Ireland, Scotland, the Isle of Man, Anglesea, and Wales, but rare in England, though seen in the sculptured stones at Sandbach in Cheshire, and at Copplestone or Copstone near Crediton in Devonshire, has a particular interest from the peculiar ornamentation with which some of the examples are decorated. This class is specially illustrated in *The Ancient, etc., Mon. of Angus*, etc., fol., Edinb., 1848; SPALDING CLUB, *The Sculptured Stones, etc., of Scotland*, fol., Aberdeen, 1856;

CUMMING, *Runic, etc., Remains in the Isle of Man*, 4to., London, 1857; O'NEIL, *Crosses, etc., of Ireland*, fol., London, 1853; and BLIGHT, *Ancient Crosses*, 4to., London, 1856: some examples occur in GAILHABAUD, *Monuments*, 4to., Paris, 1850, which with his later work, *L'architecture*, abounds in representations of the emblem under consideration. Some curious crosses of all sorts are well illustrated in the volumes by NODIER and TAYLOR, *Voyages Pittoresques*. The subject of this article has been also treated at some length in HOLLAND, *Cruciana*, 12mo., Liverpool, 1835; in the *BUILDER Journal*, 1843, i, 222, 244, and in the *ECCESTIOLOGIST*, viii, 220, ix, 85, 298, x, 217, and xii, 332: this latter journal, iii, 90, 137, gives a list of village crosses; and ii, 49, 80, 111, 171, several notices of the dedication and other crosses marked on the walls of churches. DIDRON, *Iconographie Chrétienne*, 4to.

The accompanying names are those given technically to the respective crosses, which are those most usually mentioned in architectural descriptions.



A. Greek cross; B. Latin cross; C. Greek cross with four circles; D. Greek cross with four circles and four points; E. Greek cross with four circles and four points; F. Greek cross with four circles and four points; G. Greek cross with four circles and four points; H. Greek cross with four circles and four points; I. Greek cross with four circles and four points; K. Greek cross with four circles and four points.

The *Illustrations*, s. v. Cross, give examples of some of the applications of this subject.

**CROSS AILE.** The term used 1500, for the cross arm of a church. The German term is cross-way (*gang*) 'kreuz-gang', also cross nave 'quer-schiff', and these are all preferable to the usual English term **TRANSEPT**.

**CROSS ARCH.** The name given to a double arch, formed of one reversed standing upon another; very few examples occur, except in decoration. Among the instances of its use in construction may be named the example at Glastonbury mentioned by LELAND, *Itinerary*, 8vo., Oxford, 1744, iii, 103, as constructed by abbot Bere, 1492-1524, who "made the volte of the steeple in the transept, and, under, two arches like S. Andres crosse, els it had fallen"; and the four examples in the tower arches at Wells cathedral.

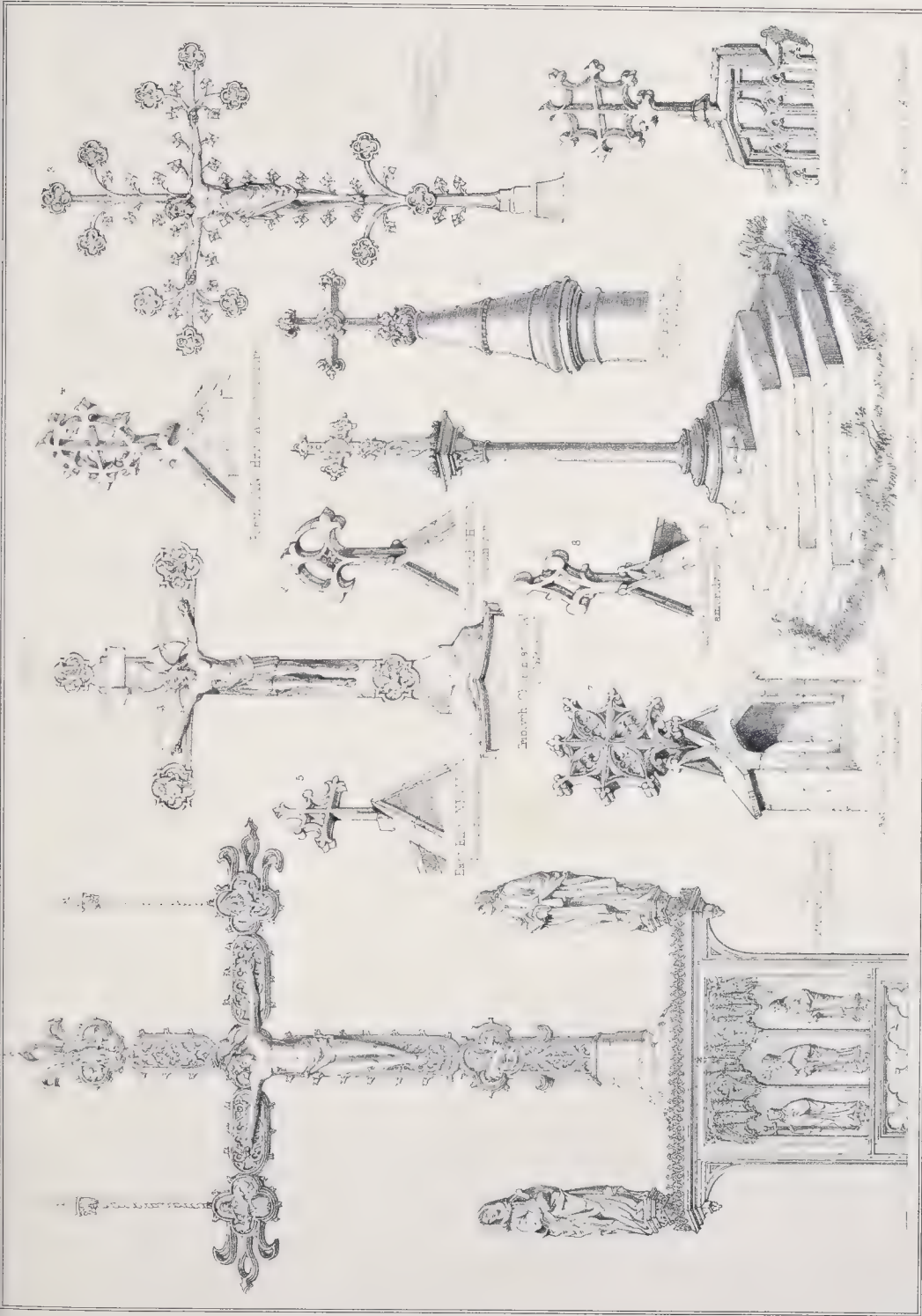
**CROSS BANDED.** An epithet applied to any veneer, on a hand rail, of which the grain crosses the rail.

**CROSS BAR** (Fr. *croisillon*), see **TRANSOM**.

**CROSS BEAM** or **CROSS-SOMER.** The term formerly used for any beam that was a girder, not a breastsomer, resting upon opposite walls. Thus "a roffe made complete with a cross somer and joystes to the same," is mentioned in *BAYLEY, History*, fol., London, 1821, i, app. 19.

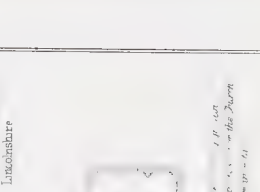
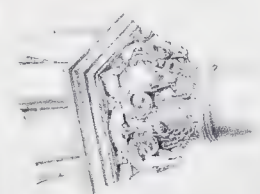
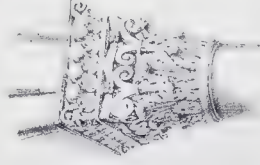
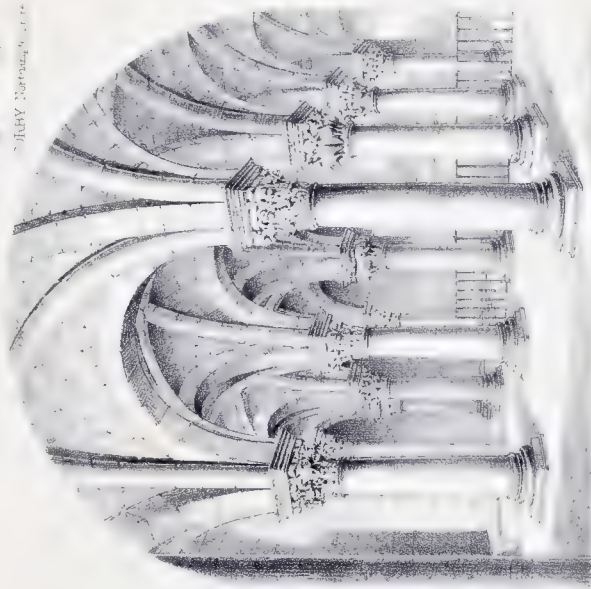
**CROSS BOND.** The name used in Germany for what is called in England "Flemish bond."

**CROSS CHURCH.** The common expression used to signify that a church is built upon a cruciform plan. If it be admitted that the basilican plan with the addition of slight projections near the altar end can hardly be said to form a cross church, it will be evident that buildings like those at Merseburg and Issoire, with attached chapels on the sides of the basilica, do not fulfil the conditions of a cross church, although they furnish examples of the transition from the basilican to the cruciform plan. Perhaps the church of S. Michele in Foro at Rimini, may be thought to exhibit the Latin cross in a plan of early date; but, as a general rule, churches belonging to the western ritual, and built on a thoroughly cruciform plan do not occur much before the end of the tenth century. Although the Greek cross was employed in the cases of S. Mark at Venice, 975, and S. Genest at Nevers, S. Martin at Avalon, and Ste. Marie at Montmajour in France; yet when a decided case of a building originally erected on the plan of a Latin cross is sought, the earliest authenticated dates are probably those of Romsey in Hampshire, built towards the end of the eleventh century; Laach, 1093-1156, in Germany; S. Michele at Pavia; Ronceray at Angers, 1028; and Bernay incomplete 1024, in France. In these ex-









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amples the cross ailes are short, in the later Norman period they are extended, and in the Early Pointed buildings the length was again increased, though the cross aile rarely extended further than three compartments on each side of the main body of the church. The finest Gothic cathedrals have the total length of the cross ailes equal to the length of the nave up to the wall of the cross aile; or the number of bays in each cross aile is equal in number to a third of those in the nave. It is often thought that the cross aile in a cross church should have a considerable length and be a repetition of the nave in its clerestory and ailes; in general, however, only cathedrals and abbey churches comply with these conditions, though they are fulfilled in the church at Melton Mowbray in Leicestershire. Notice should be taken of the Lorraine cross in plan, formed by the double transepts, at S. Quentin in Picardy and at Cluny; and at Canterbury, Hereford, Lincoln, Rochester, Salisbury, and Worcester cathedrals.

A cross church without side-ailes, though found in the ruder ecclesiastical structures of Scotland and Ireland, as at Iona and Cashel, is rare in England; one, however, exists at Great Wilbraham in Cambridgeshire.

CROSSETTE, see CROISSETTE.

CROSS GARNETS or CROSS GARNET HINGE. A hinge in the form of the letters **H**, much used for common purposes and in rough work, as on ledged or battened doors, etc. It has a long strap on the door and also a cross piece containing part of the knuckle; the corresponding upright with the rest of the knuckle being fixed on the door post. 1.

CROSS-GRAINED STUFF. Wood having the fibres in a contrary direction to the surface, so that it cannot be perfectly planed, as the plane or the stuff is sure to turn. This defect may arise either from some twisted disposition of the stem itself, or from the projection of some branch from the trunk; in which case, if the two stems be well grown together, the cross grain will scarcely be perceived before the stuff is worked. CURLING STUFF. 1. 4

CROSS LIGHT (Fr. *jour à travers*). Windows placed in walls that are at right angles, or nearly so, to each other, admit a double influx of light called a cross light. When the windows are in opposite walls, the influx is called a COUNTER LIGHT.

CROSS QUARTER. This term is explained by WILLIS, *Arch. Nom.*, 4to., Cambridge, 1844, p. 52, as a diagonal (or cross) quatrefoil opening. CATER.

CROSS RIB (Fr. *arc doubleau*). A rib from one pier or pillar across to its respond, square with the vault to which the rib belongs. The term "master-rib" has been proposed in lieu of it. WILLIS calls it the transverse rib, and it is often called the arch rib.

CROSS SOMER, see CROSS BEAM.

CROSS SPRINGER. Each rib in a groined arch springing from the corners in a diagonal direction, *i. e.* at the intersection of the arches forming the groin. 1. 19.

CROSS STAFF. An instrument used in land surveying. It consists of a rod shod with iron which receives a rectangular cross at the top for the purpose of setting off, offset lines square with the principal ones; and for similar purposes. That in most general use consisted of four sights fixed at right angles upon a brass cross; but this instrument has been almost superseded by the optical square, as noted by SIMMS, *Treatise*, 8vo., London, 1836, p. 3.

A simple and useful cross-staff for gardening and other ordinary purposes, is formed by nailing flat on the top of the staff, a circular board of hard wood, about 6 ins. in diameter and about 1½ in. thick, having two deep saw-kerfs, at right angles to each other, in the upper side, for seeing through.

CROSS TONGUE. A term used in joinery, for the projection or tongue, made across the grain, in framing. FEATHER TONGUE.

CROSS VAULTING. A common name for groined cylindrical vaulting. 1.

ARCH. PUB. SOC.

CROTCHET. A former mode of writing CROCKET.

CROTON *oblongifolium* (*parokupi*). A tree of Gualpara, East Indies, giving a close grained and rather brittle wood, used for common furniture. Another species, called *lalpatuya*, is a hard close grained wood used for canoes. 71.

CROUDE, CROWDE, or SHROWDE (late Latin, *crota*; old Fr., *crote*, *crouste*). This term, preserved to the present day in the word 'undercroft', is best explained in the words of HIGINS'S JUNIUS, *Nomenclator*, 8vo., London, 1585, 188, *s. v.* crypto-porticus, as "a secret walk or vault underground, as the crowdes or shrowdes of Paules", called S. Faith's church. The term is preserved at S. Nicholas in Bristol, according to BARRETT, *History, etc.*, 4to., Bristol, 1789, pp. 417-495. CROFT. CRYPT.

CROUDING. The term used in brickmaking, for the act of 'running' with the bricks from the hack to the kiln, and setting them in the kiln.

CROUPE. A former way of writing CROP.

CROW BAR (It. *palo di ferro*, *leva*, *stanga*; Fr. *pince*, *levier*). A bar of iron used by quarrymen, masons, and bricklayers, as a lever, and sometimes as a pick. It varies from six-eighths to ten-eighths of an inch in thickness, being round or polygonal in section, with a small head, the other end being wedge-shaped, and sometimes forked; and is made up to 5 and 6 ft. in length.

CROWN. The vertex or top of an arch, applied generally to about one-third of the ring of any arch except a pointed one; in a pointed arch it is applied exclusively to the apex. A semi-circular apse is sometimes called a crown, from the Latin *corona*, as Becket's crown at Canterbury cathedral. H. B. C.

CROWN is sometimes used in the sense of head, as to a pile; and of top, as to any uppermost member; thus "the flat crown is a member in a Doric gate, made by so great an enlargement of the larmier that it has six times greater breadth than its projection"; NEVE, *Dict.* 1. 2. 19.

CROWN BAR. The name given to the poles or balks of timber which are employed in forming a tunnel. When a heading is driven, it is widened at the top along one side, so that a bank is formed upon which a crown bar is laid lengthways. Then another crown bar is introduced into the heading and supported at both ends; poling boards are got above the crown bars which are strutted, and another bank is formed as above on the other side of the now central crown bar. When the three crown bars are in place, the banks are cut to let in props under the side crown bars, and then the rest of the banks is removed; SIMMS, *Practical Tunnelling*, 8vo., London, 1843.

CROWN BOTTLE. The term formerly applied to a wrought stone coping upon a semicircular gable or portion of a gable, according to HOLMES, *Accidence of Armory*, fol., Chester, 1688, 3, iii, 472, who also calls it 'top bottle' (bowtel). 16.

CROWN CORNICE AND ENTABLATURE, or CROWNING CORNICE (It. *coronamento*; Fr. *couronnement*). A main cornice, sometimes having a plain or enriched frieze or platband, by which the top of a façade is defined. GWILT, *Encyc.*, p. 746, has specially mentioned this part of a design, but does not appear to have taken into calculation the value of the band or semifrieze, used in several examples with the cornice properly so called: in the following list the frieze and cornice are considered, where they occur, as together forming the whole crowning cornice. Great attention has been paid of late years to the subject of the main cornice, especially in astylar façades, and much doubt has existed as to its due proportion, *i. e.* whether it should simply have relation to the design generally of the building, and the actual height, etc., of the front, or whether it should merely be one, suitable to an order which may or may not be applied in execution. The \* affixed in the following list denotes that one or more orders are used in the façade, and that the crowning feature is designed of larger dimensions than usually adopted with the order which it surmounts. The letter G denotes the values given by GWILT as above mentioned.



Names of the Edifice, and of the Architect.		Parts of the whole height of the building, from ground to top of cornice.
<b>LETAROUILLY, Rome Moderne.</b>		
Palazzo Parma, by A. da Sangallo	-	-050
" Verospi, by O. Lungbi	-	-060
" Nari	-	-061
* " in Piazza Navona, by Barozzi	-	-082
This is the well known 'Vignola' cornice, for which he recommends a proportion of an eleventh of the total height: in the above instance it is applied above two ranges of orders.		
" Linotte, Vicolo dell' Aquila, by B. Peruzzi	-	-054
" Sacchetti, Via Giulia, by A. da Sangallo	-	-048
* " La Farnesina, by B. Peruzzi	-	-124
" Farnese, by M. A. Buonarroti	-	{ -090
" Sciarra di Carbognano, by F. Pontio	-	{ g -069
" Negroni, by B. Ammanati	-	-050
" di S. Giovanni in Laterano, by Dom. Fontana	-	-070
" Spada, by Giulio Mazzoni	-	-048
" Massimi, by B. Peruzzi	-	-044
" Mattei Paganica, attributed to Barozzi	-	-088
<b>RONZANI, Le Fabbriche, etc., di S. Michele.</b>		
* Palazzo Grimani at Verona	-	-085
" la Soranza, at Castelfranco	-	-074
" Roncali, at Rovigo	-	-117
<b>CICCONARA, Le Fabbriche di Venezia.</b>		
* Vecchia Libreria, by Sansovino	-	-154
* Palazzo Grimani, Grand Canal	-	-092
* " Cornari, near the theatre of S. Angelo	-	-074
* " Vendramini Calergi	-	-101
" Cornaro, now Pal. Mocenigo, by San Michele	-	-050
Teatro la Fenice, river front	-	-089
<b>GAUTHIER, Les Edifices de Gènes.</b>		
Palazzo dell' Università, by B. Bianco	-	-074
" Durazzo, by B. Bianco	-	-107
" Mari	-	-110
" Cambiaso, attributed to G. Alessi	-	-150
" Brignole, attributed to G. Alessi	-	-110
* " Carega, by G. Alessi	-	-115
* " Sauli, by G. Alessi	-	-100
* " Grimaldi, attributed to G. Alessi	-	-074
Villa Spinola, at Sampierdarena	-	-070
Palazzo Serra, at Cornegiano, attributed to A. Tagliacico	-	-104
* Villa Fransone, at Albano	-	-124
" Giustiniani, at Albano, by G. Alessi	-	-079
" Imperiale, by G. Alessi	-	-100
These are only approximate, as the engravings are not figured. The heights were taken to the top of the cornice, but in these buildings there is generally a balustrade or high blocking course over.		
<b>FAMIN and GRANDJEAN, Architecture Toscane.</b>		
Palazzo Pitti, this is not much more than a string-course	-	-096
" Strozzi	-	{ without band -060
	-	{ with band -132
" Guadagni (cornice projecting by cantilevers)	-	g -069
" Pandolfini, by Raffaello	-	-123
" Riccardi	-	{ -069
" Cimini	-	-116
" Gondi	-	-042
" Bartolini	-	{ -056
	-	{ -057
The above are at Florence.		
" Piccolomini, at Siena	-	-136
" Spannocchi, ditto	-	{ -074
	-	{ -139
House in Strada del Corso, ditto	-	g -081
" " " ditto	-	-051
" " " ditto	-	-060
<b>SCAMOZZI, L'Architettura di Palladio.</b>		
Palazzo Pojana	-	{ -073
	-	{ -071
Villa Caldogno	-	-065
Casino, at Cerato	-	{ -069
	-	-065
Villa Montecchio	-	{ -044
	-	{ -069
" Caldogno family	-	-063
Palazzo at Cesalto	-	{ -066
	-	-068

These are the chief exceptions to the almost invariable use of the orders, by Palladio.

**CROWN GLASS.** The common description of window glass used in England almost exclusively, before the abolition of the excise duty. It is obtained from a mixture, 16 parts sand, 5 of air-slacked chalk lime, 5 of carbonate of soda, 1½ of sulphate of soda, a small proportion of arsenic, and 16 parts of cullet; and is blown into globes which are flattened into 'tables' by the mere centrifugal action impressed upon the 'piece', as the lump of glass taken out of the pot is usually called. Crown glass is generally speaking very thin, but even in its thickness it is of a slightly green hue, especially towards the edges of the tables; but as it is necessarily exposed to much greater heats than sheet glass, it is less exposed to the danger of devitrification than the latter. From the mechanical difference of manufacture sheet glass can be made much thicker than crown; it is therefore to be preferred when it is necessary to retain heat. Crown glass is, however, more even, and presents a more brilliant lustre than the sheet, excepting near the knob or bull's eye, or the rim. The bull's eye, which is sometimes admitted into common windows, has been known, by concentrating the sun's rays, to set fire to combustible matters.

Tables of crown glass are blown from 40 ins. to 4 ft., 4 ft. 6 ins., and 5 ft. diameter, and will therefore make plates at least 33 ins. by 25 ins. The four qualities are called best, second, third, and fourth, c.c. or coarsest; but practically there are only three qualities of crown glass, as in well ordered works the quantity used of the fourth quality must be very limited; as, being of the coarsest description of glass manufacture, it is only fit for outhouses and most inferior purposes, where quality is not an object. There are a few foreign markets to which it is sometimes shipped. At present these four qualities are made in two thicknesses, *usual* and *extra*, supplied in crates of 18 and 12 tables respectively, but flattened slabs in crates of 36 and 24 slabs respectively. The crates also contained 12, 15, 18 and 18 tables respectively of the four qualities. GLASS. DUMAS, *La Chimie appliquée aux Arts*; KNAPP, *Chemistry applied to Arts*, etc.; LARDNER, *Glass Manufacture*, in CABINET CYCLO.; COOPER, *Crown Glass Cutter*, etc., 12mo., 1835. G. R. B.

**CROWN POST**, also called JOGGLE PIECE. A name applied to the king and queen posts of trussed principals, in the description given of the roof to the Sheldonian Theatre at Oxford by WREN, *Parentalia*, folio, London, 1750, p. 336.

**CROWN STEEPLE.** The name given to those towers which possess a termination in the shape, and sometimes the representation of, a crown, as at the churches of S. Nicholas, at Newcastle-on-Tyne, and S. Giles, at Edinburgh; with the crosses at Aberdeen and Glasgow. J. W.

**CROWN TILE**, see PLAIN TILE.

**CROWN TIMBER.** During a former period the best timber that came from Memel was called Crown Memel, and is said to have been marked with a crown as an emblem of its superiority. Such timber sent from Riga was principally of great length, as it was used for building masts for the Royal Navy, for which purpose it was delivered in average lengths of 36 ft., a few of 60 ft. long, in the square 12½ to 13 ins. all the way, and all free of knots. A small quantity was used in the mining districts, and for some other particular purposes. A. A.

**CROW STEP**, also called CATSTEP and CORBIE STEP. A term used for the ornamental stepwork introduced up the sides of a gable, which is hence called a stepped gable.

**CROW STONE.** This term is defined as "the top stone of the gable end on which—is set—the finishing,—the pinnacle, or what thing else is wrought in stone to set out or adorn the end of an house or building", according to HOLMES, *Accidence of Armory*, fol., Chester, 1688, 3, iii, 472. 16.

**CROYLAND.** Three persons have been recorded as architects in the Chronicle, of the Benedictine abbey of Croyland in Lincolnshire, preserved in GALE, *Rerum Anglic. Scriptores*, fol., Oxford, 1684, i, 119, 497, 515. The prior Odo and the lay brother ARNOLD, "camentariæ artis scientissimus magister," directed and managed the rebuilding, commenced March 7,

1113, of the parts that had been destroyed of the church, *i.e.*, the east end and south transept. Very probably the old foundations were left, so that the new work was begun either level with the floor or just above it; they had perhaps previously built the dormitory and a refectory: GOUGH, *History, etc.*, p. 48, and app. 193-4, in NICHOLS, *Bibl. Topog. Brit.*, 4to., London, 1783, iii. The other architects of the abbey are not named until WILLIAM, who, 1392-1417, built the *west* (not *south*) side of the cloister, the north and south aisles of the choir, the lady chapel on the north side, and the refectory; he also, 1417-27, built the western part of the nave and both its transepts with their chapels. A long account of these works is given by ESSEX in GOUGH, pp. 62, 87-8, appendix, pp. 142, 196-9; who adds to the list of this architect's works the north-west tower and spire; various buttresses to resist thrusts; the screen separating the choir from the nave; and the works erected for abbot Upton, 1417-27, who ordered the construction of the abbot's hall, and built much both within the abbey and without.

CRUCY (MATHURIN), born about 1750 at Nantes, became member of the academy there, and corresponding member of the Institute of France. He designed for his birthplace the *salle de spectacle*, erected 1786, and rebuilt after a fire, 1810, which is called one of the handsomest in the country; and the exchange, commenced 1792, suspended for several years, and finished 1812. He was living in 1830. 68.

CRUNDALE (RICHARD DE) was the builder, and probably the designer, of the Eleanor cross erected at the then village of Charing near London; he died 1292-3, before it was finished, and the works were continued by ROGER de Crundale, who in conjunction with Dymenge de Legeri, or De Reyns, had been similarly employed on another Eleanor cross at Waltham. TURNER, *Manners and Household Expenses*, 4to., London, 1841, preface, lxxxiv, pp. 93-145; *ARCHÆOLOGIA*, xxix, p. 185-9.

CRUNDEN (JOHN), born in the county of Sussex, is considered to have been a pupil of Henry Holland. He published *Designs for Ceilings*, 12 pl., fol., London, 1765; *Convenient and Ornamental Architecture*, 70 pl., 4to., 1768; *The Joiner and Cabinet Maker's Darling*, 60 pl., 8vo., 1770; and *Carpenters' Compositions for Chinese Railings, Gates, etc.*, 16 pl., 8vo., 1770. In 1774 he was appointed, under the Building Act of 14 George III, surveyor to the now three districts of S. Luke, Chelsea, Paddington, and S. Pancras, which he held until his resignation in 1825. KRAFFT, *Plans des plus beaux Jardins, etc.*, fol., Paris, 1809, allots the first eight plates to the villa, etc., built by Crunden "sur la route de Westminster"; it is supposed to be situate near Fulham. He died about 1828, about 90 years of age.

**CRUSHING WEIGHT.** The weight under which any material loses its power of cohesion, or becomes crushed. The crushing weights given in the published tables are always calculated upon the assumption that the materials to which they apply cannot yield laterally. So long as the height of the piece operated upon does not exceed seven or eight times the smallest diameter, or lateral dimension, the resistance to a crushing weight may be considered as being nearly proportional to the sectional area, although in fact it increases in a much more rapid proportion. When, however, the height exceeds twelve times the smallest lateral dimension, the resistance diminishes very markedly, and the shape of the material itself modifies the resistance in an equally remarkable manner.

The most recent and best investigations into this subject are those of Messrs. Hodgkinson, Edwin Clark, Fairbairn, Vicat, Belpaire, Navier, Rennie, and Rondelet, from whose works the following notes are compiled. HODGKINSON, in the *PHILOSOPHICAL TRANSACTIONS* for 1840, shews that the resistance of a solid column of cast iron to a crushing weight was represented by the formula,  $R = 44.3 \frac{D^{2.6}}{L^{1.7}}$  tons; in which  $R$  = the resist-

formula becomes  $R = 44.3 \frac{D^{2.6} - d^{2.6}}{L^{1.7}}$  for hollow columns,

in which  $D$  = the external, and  $d$  the internal diameter. The strength of wrought iron, compared with that of cast iron, was found to be 1745 : 1000; those of Dantzic oak and of red deal, as 108.8 and 78.5 : 1000 respectively. The annexed table, No. 1, has been calculated from the more simple formula,  $R = 44.3 \frac{D^2}{L^2}$  given by Euler, and from the above proportionate strengths; and is to be used only as an approximation to truth under the conditions hereafter mentioned.

CLARK, in his account of the construction of the Britannia and Conway tubular bridges, records that brickwork set in cement bore an average load of 521 lbs. on the square inch; and red sandstone, 2,185 lbs; while Anglesea limestone bore an average crushing force of 7,579 lbs. The experiments upon brickwork were made upon six bricks placed (two headers on two stretchers on two headers) so as to break joint; those upon the lime and sandstones were made upon cubes of 3 and of 6 inches on the side. FAIRBAIRN's observations confirm those of Messrs. Clark and Hodgkinson; but he adds the very important remark that the resistance of all materials is seriously affected by their condition of temperature, and that the time during which a load is left on them also modifies their power. VICAT had already called attention to this law. (BRICKWORK, p. 146.)

All inquiries of the same nature as those connected with the resistance to compression, must almost of necessity be based upon experiments made upon a small scale, which in fact throw little light upon the circumstances attending actual practice. Thus there are numerous tables of the crushing weights of stones, woods, bricks, etc.; though when those materials are placed in a building their resistance is modified, even if under some circumstances it be not entirely regulated, by that of the mortar or other materials inserted in the joints. GAUTHY, *Construction des Ponts*, 1, notes, p. 204, mentions that the pillars of S. Geneviève crushed under a permanent load not exceeding  $\frac{2.7}{100}$  of the weight necessary to crush instantaneously a small cube of the stone of which they were built. VICAT, in the *Mémoire sur la résistance des solides* (ANNALES DES PONTS ET CHAUSSEES, 1833) questions the deduction made by RONDELET from what occurred at St. Geneviève, and from his own (RONDELET's) experiments, namely that the resistance of a number of stones placed one above another would be considerably less than that of a single block; but he allows that the vertical joints in a mass of masonry affect its strength to a very serious extent. Provided the horizontal beds be carefully dressed, VICAT considers that the mortar inserted between them has but a slight influence on the resistance of the stone; and in the concluding remarks he states that if masonry be well executed, that is to say, if the beds and joints be carefully dressed, and the stones carefully laid, and there be no hidden defects in the stones themselves, there would be no danger of loading it permanently with a load equal to  $\frac{2}{100}$  of the weight required to crush a solid specimen of the stone intended to be used, shaped in the same manner and proportions as in the building to be erected. BELPAIRE, in *Annales des travaux publics de la Belgique*, t. vii, concludes from his own observations that it is not desirable to let the permanent load exceed  $\frac{1}{2}$  of the crushing weight of the stone or brick used; but the practice of the most careful engineers and architects is to make that load only  $\frac{1}{3}$  of the crushing weight; and indeed when the materials are small (as bricks, rubble stone, etc.) it would appear that  $\frac{1}{3}$  of that strength is the safest limit.

Notwithstanding all that has been written upon the subject, very little of precise or really scientific value is known with respect to the resistance to compression. HODGKINSON's formulae, modified to the simpler expression given by EULER, yield results which agree tolerably well with practical observation, if the value of  $D$ , in inches, be taken as 6; for any other value they cease to be even approximations, and indeed yield



results which are manifestly absurd when maximum or minimum values are taken. The tables given below for the strength of columns must therefore only be considered to be approximations, and they are given with the greater hesitation from the fact that the published records of the observations of both HODGKINSON and General MORIN contain so many clerical and typographical errors as to render it difficult to discover the precise meaning of the authors; and even FAIRBAIRN in *Useful Information for Engineers*, 2nd edition, is liable to the same criticism.

It is also to be observed that the formula,  $R = 44.3 \frac{D^4}{L^2}$  differs slightly in its results from the more accurate proportions given by HODGKINSON; yet it may be considered to be sufficiently accurate for all practical purposes. It has been adopted in this table, and D has been taken = 6 inches, and the resistance reduced to that of each superficial inch: the results agree very nearly with those given by MORIN, *Leçons de mécanique pratique*, 1853, p. 74.

TABLE I. *Breaking Weights in lbs. Avoirdupois per Inch Superficial of Wood and Iron Columns, the ratio of the height to the diameter being respectively*

Ratio L to D	10.	12.	14.	16.	18.	20.	4
Cast iron . . .	24,808	18,226	13,954	11.55	8.97	6,304	
Wrought . . .	43,380	31,804	24,379	19,238	15.88	11,875	
Dantzig oak . .	3,886	2,699	1,993	1,518	1,200	675	
Red deal . . .	2,804	1,947	1,430	1,095	846	701	187

Ratio L to D	24.	32.	36.	48.	60.	7	10 One.
Cast iron . . .	4,556	3,488	2,750	1,570	972	689	
Wrought . . .	7,950	6,004	4,801	2,705	1,531	1,202	
Dantzig oak . .	176	129	94	56	37	27	
Red deal . . .	357	274	216	122	77	51	

Now it is known that when wrought iron is loaded to more than 12 tons, or 30,880 lbs., on the superficial inch, its powers of permanent resistance are seriously affected. On VICAT's rule, that the permanent weight should not exceed  $\frac{1}{10}$  of the instantaneous crushing weight, the above table evidently gives results which may be safely adopted in practice. HODGKINSON's experiments show that the form and manner of fixing the bases of columns have great influence on their resistance; and therefore it is essential that they should be made as level as possible, whilst it is desirable to adopt tabular strengths, so to speak, which would allow a reasonable margin to guard against this source of danger.

TABLE II. *Crushing Weights per Inch Superficial of Cubes of the following Materials, with the Authorities.*

METALS.		Tons	
Iron, cast . . .		40 to 50	Beardmore. N.B. Variable.
" wrought . . .		20 to 30	" "
Copper, cast . . .		117,088	G. Rennie. These experi-
Brass . . .		164,864	ments were made on cubes
Lead . . .		7,728	$\frac{1}{4}$ in. on side.

VOLCANIC AND PLUTONIC MATERIALS.			
Basalt of Sweden . . .		27,150	Rondelet and Genieys.
" Auvergne . . .		29,507	" "
Lava of Vesuvius . . .		7,994	" "
Tufa of Rome . . .		824	" "
Porphyry . . .		35,116	Gauthey and Genieys.
Granite des Vosges . . .		8,804	Rondelet.
" de Bretagne . . .		9,256	" "
" de Normandie . . .		9,968	" "
" Cornish . . .		6,357	G. Rennie.
" Peterhead . . .		8,283	" "
" Aberdeen . . .		10,914	" "

LIMESTONES.			
Chalk . . .		500	" "
Portland . . .		4,571	" "
Compact limestone . . .		7,712	" "
Furbeck . . .		9,160	" Doubtful. G. R. B.
White Statuary . . .		6,059	" "
Black Brabant marble . . .		9,219	" "
Blue lias, near Metz . . .		4,257	Poncelet.
Roche de Chatillon . . .		2,412	" "

Liais de Bagneux . . .	6,344	Poncelet.
Roche douce, id. . .	1,845	"
" d'Arceuil . . .	3,647	"
Pierre de Saillancourt . . .	1,986	"
" second quality . . .	1,277	"
Best Lambourde of Paris . . .	851	"
Inferior ditto . . .	282	" Doubtful. G. R. B.
Gobertange (average) . . .	6,333	Belpaire.
Namur (mountain limestone) . . .	10,621	"
Soignes . . .	9,343	"

SANDSTONES.			
Craigleith . . .	4,900	G. Buchanan.	
" . . .	6,915	Rennie and Barlow.	
Yorkshire paving, bedwise . . .	5,174	"	
" against bed . . .	5,174	"	
Bramley Fall . . .	6,058	"	
Derby grit . . .	3,143	"	
Dundee sandstone . . .	6,630	"	

BRICKS.			
Pale red (place) . . .	562	Rennie.	Clamp burnt.
Red . . .	808	"	"
Hammersmith picked stock . . .	1,002	"	"
Well burnt ditto . . .	1,441	"	"
Fire brick . . .	1,717	"	Kiln burnt.
Papesteen, Belgium . . .	2,967	Belpaire.	Kiln burnt.
Klampsteen, " . . .	3,038	"	"
Furnes, " . . .	781	"	Clamp burnt.
Briquelette jaune d'Hollande . . .	7,355	"	Dutch clinkers.
Unburnt or clay . . .	488	Vicat.	"

LIMES, MORTARS, ETC.			
Plaster of Paris mixed with common water . . .	710	Rondelet and Claudel.	
Ditto with milk of lime . . .	1,036	"	
Ordinary mortar, lime and sand . . .	497	"	
Mortar, lime and pounded bricks . . .	681	"	
" lime and pozzuolano . . .	525	"	Doubtful. G. R. B.
Beton, eighteen months old . . .	568	"	"
Mortar, chalk lime, 14 years old . . .	269	Vicat.	
" , hydraulic lime . . .	1,050	"	
" , very hydraulic . . .	2,044	"	

WOODS.			
Yellow pine . . .	5,375	Hodgkinson and Fairbairn.	
Cedar . . .	5,674	"	
Red deal . . .	5,748	"	
Birch . . .	6,402	"	
Sycamore . . .	7,082	"	
Spanish mahogany . . .	8,193	"	
Ash . . .	8,683	"	
Dry English oak . . .	9,509	"	
Box . . .	9,771	"	
Beech . . .	9,048	"	
Elm . . .	10,331	"	
Teak . . .	12,101	"	

MORIN, *Aide-mémoire de mécanique pratique*, 8vo., Paris, 1853, gives the following useful table of the resistance of various bodies to crushing weights; it is here rendered into English weights and measures:

TABLE III. *Safe Load to be put upon every Inch Superficial of the transverse section of the following Substances, in pounds Avoirdupois.*

Substances	Ratio of Length to Smallest Dimension.				
	Below 12.	12.	21.	48.	60
Hard oak . . . . .	126.64	355.56	213.80	71.10	35.55
Weaker oak . . . . .	270.18	119.45	76.63	..	..
Red or yellow fir . . . . .	333.25	440.82	295.11	100.65	..
White fir . . . . .	197.93	116.90	89.64	..	..
Wrought iron . . . . .	14,230.00	13,856.08	7,110.00	2,374.74	1,104.48
Cast iron . . . . .	28,460.00	23,747.40	14,220.00	4,735.36	2,374.74

It is essential to observe that in building operations the powers of resistance are measured by the weakest portions, and that therefore it is more important to ascertain the resistance of the mortar, or of the foundation, than that of the bricks or stones to be used. VICAT observes that stones resist crushing weights better when they are of a circular form. COHESION.

CRUZ DE TENERIFFE (SANTA). The capital city of the Canary islands. The houses are low, a few however being of two stories, and they are whitewashed and painted. The streets are well paved; the square has good edifices, and con-

tains a colossal group. There are two churches, one of them being called magnificent; three hermitages; two cemeteries; a custom house; a military hospital; a prison; a poor's house; six schools; several fountains, and two promenades: the city, however, presents but little of artistic interest. 50.

CRUZ DE LA SIERRA (SANTA). A city, formerly the village of Lorenzo de la Frontera in the province of Barañça, or rather of Sta. Cruz, in Bolivia. The houses, one story in height, roofed with the Carondai palm, are built of timber and clay, with large balconies: the windows are not glazed, although the streets are covered with fine sand many inches in depth. There are a cathedral dedicated (1605) to the Holy Rood, an episcopal residence, and two other churches. 50. 96.

CRYPT (It. *scurolo*, *sotto-choro*; Sp. *cripta*; Fr. *crypte*; Ger. *gruft*; from *croupte*, used in the seventeenth century in some parts of France, probably is derived the English *crowd*, *croude*, sometimes written *shroud*). This term, derived from the Gr. *κρύπτω*, was applied in the Latin form *crypta*, to any place which was used, in the Catacombs, by the early Christians as a site for the celebration of divine service: such a spot frequently contained the remains of a martyr or other co-religionist. The catacombs themselves were called crypts by writers in the last two centuries, as a consequence of the application of the term by classic authors to any cellar, vaulted place, cavern, grotto, sepulchre, tunnel, and even sewer. The word is also applied to the subterranean works at Inkermann, etc., described by DUBOIS DE MONTEPEREUX, *Voyage*, fol. Paris, 1843 (planches) series 3 and 4. Ordinarily, however, the name was given to the story which, until the fourteenth century, was constructed or contrived for peculiar services such as the mass 'de profundis', for sepulchres, and perhaps in some cases for places of security: the latter supposition arises from the frequent provision of a well in the crypt of a church erected in a district exposed to sudden invasion: the use of the basement under a chapel as a wine-cellar, is an English innovation of the last hundred years.

That the crypt was intended to be used as a sepulchral chapel is evident from the facts that the chronicles call it a subterranean chapel or oratory; that its popular name in Italy is *confessione*; and that its usual size and position was that of a chapel containing an altar or altars under the high altar. The number of altars depended much upon the size of the crypt, which frequently extends under the whole of the choir, sometimes even under its chapels; occasionally it includes the space covered by the transepts; and in a very few cases, comparatively speaking, it coincides in plan with the church above it: no example, carried to this last extent, is known in France: perhaps the crypt at Canterbury is the most complete instance that can be adduced. The crypt, however, is not confined to these portions of a church: there are two very ancient vaults under the tower at Irthlingborough in Northamptonshire, as well as another under the south chancel; there is one under the south aisle at Bosham in Sussex; and at Chartres cathedral the crypt runs under the side aisles and absidal chapels, but not under the main aisle, of the nave and choir. The crypt has usually columns (square piers are rare) carrying barrel vaults; for the finest crypts, both in England and in France, are those which belong to the Romanesque style, and were preserved when the upper structure was rebuilt, as at Rochester, Worcester (perhaps the finest), and York; the ceiling of the crypt under the church at Vic in the Bourbonnais is flat.

It is remarkable that the provision of crypts appears to have been rare until the period of Romanesque art, and to have ended about the time that the Italians ceased to frequent the catacombs. Some of the comparatively modern crypts exhibit a great amount of architectural decoration; such as that in the church of S. Martino ai Monti at Rome, given in the *Illustrations*, s. v. *Confessione*, and also that of the tomb of S. Francesco at Assisi under the lower church. Care must be taken not to confound with the crypt, as the term is now understood,

any mere basement or underground vault, even if it has been used as a chapel, a mistake committed by TAYLOR, *Index Monast.*, fol. London, 1821, pp. xv, xvi; or with the under chapel (Fr. *basse-chapelle*) of a double or two-storied chapel, such as the Ste. Chapelle at Paris, S. Francesco at Assisi, and Mont S. Michel, Normandy: but with this exception, the term seems appropriate to every natural or artificial story below the ground floor of a church or chapel, although this story may be partly or entirely above the level of the ground outside, either from the fall of the ground as at Bourges cathedral, or from the actual construction of the choir as at Cahors cathedral; at S. Gereon in Cologne; at the cathedrals of Canterbury, Glasgow, and S. Eustorgio in Milan, where the crypt is level with the nave. The crypt in some such cases (as at Glasgow) is so well lighted from the ordinary windows (see the plan of Montmajour, s. v. ARLES) as to destroy the general impression that it is a dark vaulted space. There are very few examples of a crypt in Ireland. The crypt at CAMBAY is mentioned as being unusual. A list of examples and illustrative works is given s. v. by GUENEBault, *Dict.*, 8vo., Paris, 1843; and the crypts at Lavingham and Oxford in England, and at Issoire in France, are illustrated in GAILHABAUD, *Mons.*, ii.

CRYPTA. The Latin term employed by VIRGILIUS, vi, 5, for the cellarage (not necessarily subterranean) round the inner courtyard of a Roman villa or farm house. This was used for grain, fruit, etc.; while less perishable articles were put, along with the stables, in the *vestibulum* or fore-court. It was long and narrow, perhaps vaulted and dark, for *crypta* was also applied to a sewer and a tunnel. In the inscription on the chalcidicum of Eumachia at Pompeii, and in the following passages "cryptam et porticum" (MURATORI, *Nov. Thes.*, fol., Milan, 1739, p. 481; "post cryptam (Balbi) ad theatrum", REINESIUS, *Syntagma*, fol., Leipsic, 1682, p. 273; the word *crypta* might seem to be used as an abbreviation of CRYPTO-PORTICUS.

CRYPTOPORTICUS. A term (compounded of the Gr. *κρυπτός*, 'concealed or covered up', and the Latin *porticus*) for an enclosed gallery, used for walking and conversation, which was a common addition to the villa or country house of the Romans. PLINY, *Ep.*, ii, 17, gives a very clear account of that at Laurentinum, from which it appears that this example had a range of windows on each side; the openings on the side next to the sea being more numerous than on the opposite side next the garden; and that the building served also to shelter, and to reflect warmth upon, a terrace in the garden: and v, 6, he speaks of stairs which led from a bath to a cryptoporticus; in another place, of the upper cryptoporticus; and in another, of a cryptoporticus 'subterraneæ similis', which consequently was not underground. Some of such buildings were perhaps partially sunk in the ground; others, as at the villa called Hadrian's, were completely below the surface, receiving light and air from openings at the ends, and from perforations in various places. These corridors served the double purpose of securing cool air in summer and a sheltered walk in winter. SIDONIUS APOLLINARIUS, *Ep.*, ii, 2, repeats almost the very expressions used by PLINY. Perhaps the passage round three sides of the basilican building called the chalcidicum of Eumachia, on the forum at Pompeii, may be considered as one specimen of a cryptoporticus. CRYPTA. 6.

CRYSTALLIZATION. The property which some bodies possess of arranging their ultimate molecules in geometrical forms, whilst passing from the liquid to the solid state—the new products so arranged being known by the name of *crystals*. Crystals may be formed by allowing melted bodies to cool gradually, or by allowing the liquid solution of the bodies operated upon to precipitate, either by deposition or by evaporation; but in all cases it is essential that the process should be slow and uninterrupted. Most mineral substances affect a definite form of crystallization; the study of their forms becomes therefore a subject of great importance to the metal



worker, and the mining engineer; it is also to be observed that the same substance may assume different forms under peculiar actions, which are consequently said to produce in it dimorphism, polymorphism, or pseudomorphism. At the present day, the various forms of crystals are all ultimately classed in one of six divisions or systems; and in each of these systems there are series of forms to be met with, either free, or in combination with one another; but the forms of one system are never found in combination with those of another system. The edges, faces, and angles, for instance, may vary in every possible manner; but the axes are invariable. For this reason crystals are arranged in three principal groups, according as they may possess axes of either one, two, or three different orders; and the two last groups are subdivided according to the number of their identical axes, or to the relative positions of the latter.

To the architect, the study of the laws of crystallization is of great importance; inasmuch as the resistance of the various materials he habitually employs is singularly affected by the conditions under which that process takes place. Thus, in cast iron the large open crystals which are produced in great masses of the metal by a gradual cooling, are not considered to increase its immediate powers of resistance to a crushing or to a breaking weight, though it is known that the metal possessing such a structure is tougher and more elastic—certainly more malleable—than the metal which presents a smaller crystalline character. In cast iron, too, any subsequent interference with the natural arrangement of the crystals is destructive of its powers of resistance; but in wrought iron, on the contrary, the resistance of the material depends entirely upon an artificial arrangement of the fibres which is produced after the crystallization has ceased. Something of the same kind takes place in all rolled or milled metals, such as lead or zinc, which are rendered more ductile and more able to resist tensile forces by that operation; though many able practitioners believe that the power of resistance to atmospheric influence is thereby impaired. This latter remark, perhaps, may be extended to the influence of rolling upon glass; and it becomes a question of considerable interest whether the mechanical interference which takes place with the crystals, by the rolling to which some qualities of glass are exposed, may not tend to facilitate the peculiar action known by the name of "devitrification."

The nature and extent of the crystallization of building stones has a very marked influence upon their resistance to external actions. Pure carbonate of lime, for instance, unless it has been exposed to the conditions of heat and pressure necessary to allow it to crystallize, remains soft and easily soluble in water containing even a feeble excess of carbonic acid. This is the case with chalk, a pure natural carbonate of lime; but the more crystalline limestones, such as the Portland or the Aubigny stones, are harder, they are able to support a greater crushing weight, and, when properly placed, to resist atmospheric action more successfully; and again, the distinctly crystallized marbles are the densest, strongest, and most durable of the whole class of the pure carbonates of lime. In the case of the siliceous bodies the same law appears to hold; for the amorphous *gypse*, or siliceous beds of the subretaceous formations, are easily soluble in caustic alkali, while pounded flints are only soluble under pressure, and quartz or the highly crystalline silica is not soluble at all. In artificial cements, the law also holds; and the pure hydrates of lime, which crystallize very slowly indeed—even if they ever crystallize at all—remain for indefinite periods soft and soluble; while the simple or the double silicates of lime, if they be only allowed to crystallize before being exposed to the action of running water, a process which takes place with comparative rapidity, are able to resist its solvent properties. It is important, however, to observe that all crystallizations are not permanent. In the case of the sulphate of lime, for instance, although that mineral may be distinctly crystallized, it will still continue to absorb water, and in a rude manner to deliquesce, like salt, if exposed to the

action of small quantities of that fluid. It is even said that mere mechanical impact may alter the internal structure of bodies, and that wrought iron, especially when frequently struck in the same direction (with respect to the axes of its crystals), loses its fibrous character, and reassumes the crystalline one; whilst the magnetic currents which pass through bars of iron standing vertically are equally supposed to change the ultimate molecular arrangement of the latter. There is great uncertainty upon this question of physics, and many able observers even deny the fact of the change of structure in iron under percussion; but the balance of opinions amongst practical men is decidedly in favour of the belief that wrought iron subjected to percussive or vibratory action seeks to resume its more normal crystalline condition.

The hardening of limes, cements, and plasters, depends, in fact, upon the crystallization of the hydrate formed by combination with the silicates of lime, alumina, or magnesia, or with the sulphate of lime; and it is therefore important that the process should be allowed to terminate before the respective materials are exposed to extraneous forces; and thence the necessity for not loading concretes or mortars until they have *set*, as workmen designate the combined processes of hydration and crystallization. During the process of hydration some limes expand, but they contract afterwards in the course of crystallization, as for instance the stone limes of the south of England: it is for this reason that the use of "hot" lime is so very objectionable. The double silicates of lime and alumina vary in their conditions of change of volume according to the relative proportions of the silica and of the alumina; thus the stones which contain an excess of silica produce a lime which swells in setting or crystallizing, whilst those which contain an excess of alumina shrink. The overburnt limes also expand in setting; and it is for this reason that great care is required in the use of the so-called Portland cements in large masses of masonry. In the application of the sulphate of lime in walls the same phenomenon occurs in a very marked manner; and it expands so much during the imperfect crystallization it goes through, that particular precautions are required to be observed in its use. The builders of Paris, in fact, always leave a space at the junction of transverse walls, in order to allow the latter to expand during the setting of the plaster. Some of the inert sands or cinders used in the preparation of mortar produce valuable effects, by allowing the limes or cements with which they are mixed to expand freely.

HAUY, *Tableau comparatif des resultats de la Crystallographie*, 8vo., Paris, 1809; ACCUM, *Crystallography*, 8vo., London; BEUDANT, *Mineralogie et Géologie*, 12mo., Paris, 1851; MILLER, *Crystallography*, 8vo., London, translated by SENARMONT, 8vo., Paris, 1842; EBELMEN, *Recueil de Travaux Scientifiques*, 8vo., Paris, 1855. ATMOSPHERIC INFLUENCE. G. R. B.

CRYSTAL WHITE SHEET GLASS. A recent (1857) invention, is made of first, second, and third qualities, and is sold in cases of one, two, and three hundred feet. Its superiority to other glass in whiteness renders it very useful for glazing coloured works of art or manufacture.

CTESIPHON. The ancient name of a city, in the southern portion of Assyria, now chiefly known in its vicinity by the title of Suleiman Pâk, a Mahometan saint or hero, whose tomb, here situated about twenty miles from Bagdad, is kept in repair. The ruins of Ctesiphon, like those of its predecessor Seleucia, built on the opposite or western side of the Tigris, extend for miles, and consist chiefly of mounds: these represent structures that had basements, made of burnt brick, carrying walls built with bricks formed of clay mixed with chopped straw, and sun-dried; each course was separated from the next by irregular layers of reeds. Ctesiphon still possesses one remnant of its ancient splendour in the Tâk Kesra, situated about half a mile from the river, generally supposed to date about A.D. 540-50, and illustrated by FLANDIN and COSTE, *Voyage (Perse Ancienne)*, fol., Paris, 1841, pl. 216-7, text,

p. 174, who give the following dimensions. A hall, 116 (but according to KEFFEL, *Personal Narrative*, 8vo., London, 1827, i, 130, 157) ft. long, 74 (KEFFEL, 85) ft. wide, and 91 ft. high to the underside of the crown of its vault: this vault, which has an ellipse cut on its minor axis for a section, is about 4 ft. 6 ins. thick, containing 8 in. tubes placed at regular distances apparently for ventilation, and is carried by walls about 23 (KEFFEL, 15) ft. thick. This ellipse shows as a grand archway 72 ft. wide in the centre of a façade 270 ft. long, that has been about 100 ft. high, with, traditionally, equal additional height. The front wall, about 18 ft. thick, is spaced out in stories of blank windows having semicircular heads, with engaged coupled and single columns. The style might almost be called Romanesque. The edifice is composed of fine furnace burnt bricks, each 12 ins. square by  $2\frac{3}{4}$  or 3 ins. thick, with beds of mortar 1 in. thick; the outside and inside faces of the walls appear to have been coated with cement. LAYARD, *Discoveries*, 8vo., London, 1853, p. 570, calls it a great Iwan or summer residence, flanked by sleeping and other rooms to its height.

CTESIPHON and his son Metagenes are the architects to whom writers generally attribute the erection of the columns and entablature for the second temple to Artemis (Diana) at Ephesus. The foundations were prepared about 600 B.C. by Theodorus of Samos; but the pillars were not erected until about 560 B.C. according to HERODOTUS, i, 92, who thus fixes the period at which Ctesiphon flourished. STRABO, xiv, mentions that the temple (probably the *peribolus*) was enlarged by another architect. The edifice, as completed by Demetrius and Papias about 380 B.C., was that which was rebuilt by Deinocrates after the fire B.C. 356. It was octastyle and dipteral, 425 ft. long by 220 ft. wide, with one hundred and twenty-seven white marble columns 60 ft. high, according to PLINY, *H. N.*, xxxvi, 21, and VITRUVIUS, iii, 1: the latter author mentions, x, 6, the contrivances of Ctesiphon for the transport of the shafts from the quarries, and of Metagenes for the carriage of the architrave blocks, each 30 ft. in length; and, vii, preface, notices that they left a description of the building. PLINY, vii, 38, also intimates that Ctesiphon removed to Ephesus from Chiosus in Crete; yet there are such variations of the father's name in the manuscripts and editions of the authors above cited, as shewn in SALMASIUS, *Exercit. Plinianæ*, fol., Utrecht, 1689, pp. 571-3, as to give some probability to the conjecture that it should be written Cressiphon, i. e. Cretan language speaking.

CUBICULUM; CUBILE; CUBITORIUM. The Latin names for any room containing a sofa or a bed; CICERO, *Cat.*, iv, 8; PLINY, *Ep.*, i, 3; ii, 17; who, v, 6, uses the expression dormitorium-cubiculum. VITRUVIUS, vi, 6, notices that cubacula and bookrooms should look eastward, as they are chiefly used in the morning. Suetonius, *Nero*, 12, uses cubiculum for the pavilion containing the bed on which the emperor reclined when presiding at the amphitheatre or circus, and adds that this pavilion at first had only small openings, but was afterwards entirely open at foot. VITRUVIUS uses cubiculum, or as some read the word, *cubile*, iv, 2, for the columbarium into which the ends of beams, etc., were laid, and ii, 8, for the bed of masonry. In later times, according to MORONI, *Diz.*, 8vo., Venice, 1841, s. v. Cappella, pp. 96-8, as cubiculum meant a chapel, and also a place for the reception of the articles to be used at the communion table, so the *fr. cappella* and perhaps the *fr. chapelle* became names for the cupboard of plate, etc., kept by prelates and nobles for the service of their oratories. 6. The small rooms leading out of the *atria* at Pompeii are good instances of cubacula. It has been conjectured that those which are painted black were intended for the siesta, or sleep in the heat of the day; the colour mitigating the glare of the sun, and absorbing much of its heat.

A. A.

CUBIT. A measure of length, which may in general be taken at about 18 ins. of the English standard. The Egyptian cubit was equal to the Samian  $\pi\eta\chi\upsilon\varsigma$ , the common Greek cubit,

ARCH. PUB. SOC.

as shewn by HERODOTUS, ii, 168, who, 149, explicitly states 1 stadium = 100 orgyæ = 400 cubits = 600 feet = 2400 palms. The Roman cubit had a similar relation to the foot; for PLINY, *H. N.*, xxxiv, 16, gives seventy cubits as the height of the Rhodian image, which FESTUS, s. v. Colossus, says was 105 ft. high. The varying lengths of the ancient and modern cubits have been considered in SHAW, *Travels*, 4to., Oxford, 1757, p. 38; DESCRIPTION DE L'EGYPTE, *Antiquities* (text), vii, 493; BOECKH, *Metrologische Untersuchungen*, 8vo., Berlin, 1838, p. 211. ORIGEN and S. AUGUSTINE, in their treatises on the book of Genesis, are said to mention a geometrical cubit of nine feet; and a cubit of two feet is specified by HERO of Alexandria. For the divisions of the cubit, see DIGIT, PALM. The cubit of Ceylon is nearly 2 ft. 3 ins.; FERGUSSON, *Handbook*, i, 41.

CUBZAC. A town situated on the river Dordogne, in the department of Gironde, in France. It is remarkable for the iron suspension bridge, built 1835-39, having five waterways, each being 357 ft. 6 ins. from centre to centre of supports, with a viaduct, etc., at each end of the structure 813 ft. 6 ins. long, giving the bridgeway a total length of 3,415 ft. The height of the piers from lowest water level is 128 ft. 6 ins. The whole bridge, 25 ft. 6 ins. wide, cost £125,000. It was published by MARTIN, *Pont de Cubzac*, etc., fol., Paris, 1841; and in the *BAUZEITUNG Journal*, fol., 1845, pl. 658-9, p. 91.

CUDDY. A tripod forming a fulcrum for a long pole used as a spring-lever in depositing heavy weights, such as large blocks of stone, in their proper places.

CUELAP. A village in the district of S. Tomas in Peru. It is remarkable for a ruined necropolis of the ancient denizens, which is a terrace 3,300 ft. long, 513 ft. wide, and 137 ft. high, carrying another 550 ft. long, 458 ft. wide, and also 137 ft. high, formed by a collection of cells 16 ft. 6 ins. long and 13 ft. 9 ins. wide, made of hewn stone: in these as well as in the terraced wall are niches for the corpses, which are found in a sitting position with the chin upon the knees; according to the description given in RIVERO and TSCHUDI, *Antiquedades*, 4to., Vienna, 1851, p. 274.

CUENÇA. A city in the province of New Castile in Spain. The narrow streets are winding, as in other cities situated like this upon a hill sufficiently steep to dispense with drains: the old houses and churches are built in some cases upon the high wall of the town; which is thus rendered very picturesque. Six gates lead to as many bridges which cross the surrounding valley: the chief of these, called S. Pablo, 320 ft. long, built 1523, with arches rising 136 ft. in the clear, connects the Dominican monastery with the town. The cathedral, dedicated to the Nativity of the Virgin, and rebuilt by Alonso IX, 1217-26, is considered to be one of the finest examples in Spain of Pointed architecture; it possesses also much Plateresque work. It was founded 1177, and is 286 ft. long by 128 ft. in the transept, the nave is three-aisled; and there is a range of chapels outside the semicircular-ended five-aisled choir. The façade was commenced 1664 by Josef Arroyo, and continued 1669 by Luis Arriaga, who also designed the mint, now disused. The quadrangular northern cloister by J. A. Rodi, 1577-83, has five arches on each side, between Doric columns engaged for a quarter of their diameter, and built of dark stone from the neighbouring quarry of La Hoz. The annexed episcopal palace is a combination of old buildings, amongst which the portal and a saloon have been specially noticed. Of the thirteen parish churches, it will be sufficient to name S. Pedro, circular; S. Andres, with the nave diminishing in width towards the altar; S. Miguel and S. Esteban, each being two-aisled churches of unequal width; while the elliptic churches of the Concepción Francisca, and of S. Lorenzo Justiniano, are all that deserve notice of the fourteen monastic establishments once existing. The other chief buildings are the *casas consistoriales*, and the showy *casa de Misericordia* or de Recogidas, 1776. 28. 50. 85.

CUENÇA or RAMBAE. A city founded 1557 in the province of the same name in the state of Ecuador in South Amer-



rica. The streets are broad, and well supplied with streams of water; the houses have rarely an upper story, being built of sun-dried bricks, and tiled; the great church, made cathedral 1786, is poor; and there are only in addition two parish churches, four monasteries, two convents, a college of Jesuits, an hospital, and very few other public buildings. 50.

CUGINI (ANTONIO) of Reggio, born about 1678, became a pupil of F. Galli Bibbiena, and subsequently ducal architect. His chief buildings were the *armeria ducale* and the *teatro di Corte*, at Modena; the theatre of the college at Parma; and the theatres at Brescia and at Padua; but his great work was the rebuilding of the *teatro del Pubblico* at Reggio, after the fire 6 March 1740: at a cost of 40,000 scudi (£2,500), it was finished in six months (the pit is only 80 ft. long by 40 ft. wide), with its concert or assembly room, forty-eight other rooms, and a portico 230 ft. long. This theatre, said to be acoustically excellent, was engraved by Carlo Manfredi 1742. Cugini died 8 February 1765. The organ-case in the church of the B. V. della Ghiaja at Reggio, designed by him, is often considered to date a century earlier. 93.

CUJABA. The capital of the province of Matto Grosso in Brazil, having only one church, which is cathedral and dedicated to the Saviour; an episcopal palace; a nunnery; an hospital; and a *seminario*. The streets are paved, and the houses are formed in frames plastered with clay and straw. 50. 96.

CULAM. The name given in the southern portions of Hindostan to a tank formed to hold a supply of water for domestic purposes; such a cistern is frequently lined with masonry, and is sometimes amongst the most elegant of the native works; BUCHANAN, *Journey*, 4to., London, 1807, i, 12. In the north of India it is generally called TALAO.

CULATIUM. This word occurs in the *Domesday of S. Paul's*, London, published by the CAMDEN SOCIETY; and explained by HALE as probably equivalent to 'lean-to'. s. s.

CUL DE FOUR. A French term that has no better equivalent in the English language than 'oven shaped', and is applied to a vault spherically formed, and circular, elliptic, or oval on plan; GWILT, *Encyc.*, sec. 1995, applies this term to a semi-dome. The Fr. *cul de four en pendentif* is simply a dome on pendentives. 1. 2. 5.

CUL DE LAMPE. A French term signifying the 'bottom of a lamp', which has been adopted in England for a sort of pendentive formed in the resemblance of the general outline of a reversed cone or pyramid, either by corbelling or coving to sustain a turret, etc.; for the pendent keystone seen in some mediæval vaulting; for a sort of console carrying a statue, vase, etc.; or for the mass of ornament frequently introduced at the head of a panel or in an angle, in all which the peculiarity of the form is generally preserved. A good list of examples is given in GUENERAULT, *Dict. Icon.*, 8vo., Paris, 1843. 5. 25.

CUL DE SAC. The French term, meaning 'bottom of a bag', which is frequently employed in England, as on the Continent, to signify a blind alley, court, road, or street, although the term originally was restricted to a small street that had only one entrance; any public passage of less importance being called in France *impasse*. 5. 25.

CULLET. The name given to a piece of broken window glass, and collectively to a number of such fragments gathered to be taken to the glass-house for remelting.

CULLET (FRANÇOIS) was *maître-maçon de l'œuvre* to the chapel built in the fifteenth or sixteenth century by the confraternity of S. Sacrament at the church of S. Pierre du Queiroix at Limoges. COMITÉ HIST. DES ARTS, etc., *Bulletin*, 8vo., Paris, 1843, ii, 463.

CULLIS, from the Fr. *coulisse*. Any piece of timber with grooves in it; such as the posts which hold the flood gates in a sluice: it also meant a gutter, as is evident from a "tiled and killed" roof in the survey of the palace at Richmond, 1649, given in the *MONUMENTA VETUSTA*, 4to., London, 1808, ii, 17, 18. PORTCULLIS. 19.

CULM in Prussia, see KULM.

CULMEN, see MATERIATIO.

CULNA in Bengal, see KHALANA.

CULTER. The terms 'in cultrum', used by VITRUVIUS, x, 10, and 'in cultro', x, 14, have the same meaning, viz. 'perpendicularly', as the It. *per coltello*, used when an object is placed on its smallest edge.

CULVER. An old English word for a dove; thus CULVERHOUSE meant a pigeon house or dove-cote; and CULVERTAIL or DOVETAIL was a term employed in carpentry. CULVERHOLE meant the hole left in a wall for the insertion of the end of a beam or joist. COLUMBARIUM. 23.

CULVERT (It. *porticello*; Sp. *alcantarilla*; Fr. *ponceau*). A short tunnel, made for the passage of water only, through any embankment supporting a road, canal, etc. It is generally constructed of brickwork, but sometimes of stone; the section almost invariably being arched in the upper portion, an inverted arch for the bottom, and upright or sloping sides. If the culvert be large, proper wing and retaining walls must be built to secure the sloping banks. It sometimes forms a species of syphon drain. 1. 23.

CULY. The measure of length and area employed round Coimbatore in Hindostan. According to regulations,

24 adies or feet = 1 pole.		English sq. feet
1 pole square = 1 culy		= 570
100 culies = 1 canay or chdi		= 57,000
220 " = 1 mau or eandaca		= 176,720

"but out of what is called charity, the pole is in fact very often a bamboo that is 26 adies or 22 ft. 8 ins. long; the ady or Malabar foot is therefore 10.46 ins. nearly, and the customary canay contains 51,375 square feet"; BUCHANAN, *Journey through Mysore*, 4to., London, 1807, i, 6; ii, 208, 252, 311.

CUMA, the Roman CUMÆ. A city, once the most important in the south of Italy, situated on the coast of Campania, in the kingdom of Naples. The town formed a triangle of considerable extent, reaching to the three lakes Averno, Fusaro, and Licoli. The only remains of the fortification are a brick wall 60 ft. high, between two hills, in which is a gateway 18 ft. wide, with large niches on each side; this is called the Arco Felice. There are some masses of Cyclopean masonry on the old arx or citadel, which is now called the "Rocca di Cuma"; on this arx was the temple of Apollo, and the cave of the Sibyl: of the former, all that remains is part of a fluted Doric column with its capital: several caves are shewn as the latter: also considerable remains of an amphitheatre, which had twenty-one rows of seats: the square vaulted cella of a temple to Jupiter, now called il tempio del Gigante: a temple of Augustus, excavated by cardinal Acquaviva in 1606: and of Serapis, found in 1839. Some excavations from about 1852, by the prince of Syracuse, have discovered a temple of Diana; the remains of a Forum; and several tombs in the necropolis or burial-ground. The dead have been interred there for ages. Immediately below the surface are the Roman tombs; beneath these are those of the Greek period; while at a depth of about 30 ft. are the sepulchres of the early settlers from Asia Minor. An account of this city and necropolis, by ASHPITEL, is given in the *ARCHEOLOGIA*, xxxvii, 316. The site is now chiefly occupied by vineyards, and a few scattered houses of the contadini. *ATHENÆUM Journal*, 1853, p. 142, etc., and 1854, p. 19. etc. A.A.

CUM CEILING. A corruption of camp ceiling, used for the sloping part of the ceiling in attics. W. R. C.

CUMIER (LEO) is commemorated in an inscription published by KNIGHT, *Normans in Sicily*, 12mo., London, 1838, p. 177, as the architect (perhaps a German) who superintended 1222-38 the reconstruction of the church of Sta. Maria at Randazzo.

CUMPAS. The native name for a large tree found in the woods of Penang, giving a light brown wood, used only for planks. 71.

CUNE. An old mode of writing QUOIN.

CUNEO, in Piedmont, see CONI.

CUNEUS. The term, corresponding to the Gr. *κερκὶς*, employed in the descriptions of the Roman theatre for each wedge-like body of seats, separated by the *scalæ*, or *climaces* or stairways, from its like seats in the *cavea* or *coilon*: VITRUVIUS, v, 6.

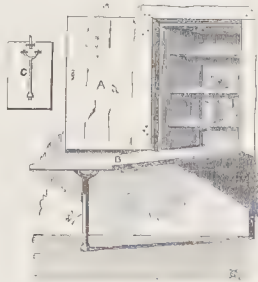
CUNEUS is also used by VITRUVIUS, vii, 4 and 5, for a species of ornament which he says ought to be "silaceorum, minaceorumque cuneorum". The "sile" here alluded to is supposed to be Attic ochre, the minium red lead. The ornament was therefore probably a sort of zigzag or dancette of red and yellow: it is very common in the mosaics and paintings at Pompeii.

A. A.

CUNONIA CAPENSIS, red alder. A tree growing at the Cape of Good Hope to a size of from 2 to 3 ft. in diameter, and from 15 to 25 ft. in length: the wood is hard and tough. 71.

CUOBERGER, see COEBERGER (WENCESLAUS DE).

CUPBOARD. The mediæval cupboard as a table for the display of plate answered to the sideboard in a modern dining-room. It appears to have risen by degrees into the *dressoir* and *buffet*; the triangular corner cupboard held its ground until very lately, and is now superseded by the *étagère*; when the former had doors they nearly resembled the modern cupboard. Such a piece of furniture was often placed in a recess, especially on the side of a chimney-piece; and when it became the custom to build chimneys so that one flue was placed before another in the rooms, it was easy to put doors to the recesses so formed in each apartment; this method of making cupboards, *i. e.* closets, is mentioned as a great improvement in building, in works published 1726-36. About the beginning of the present century fashion began to change with respect to cupboards; and, although they are now expected in houses of ten rooms or less, the architect will rarely willingly provide these nurseries of bad air, dirt, insects, and spontaneous combustion. The illustration represents a cupboard in the cells of the Certosa at Florence; A, the door, when opened allows the flap, B, to fall down and form a table, the door passing over it when required to shut up the contents: C, the underside of the flap, shows the leg-iron and the latch.



CUPOLA, before the present century frequently written CUPALO and CUPOLO. The proper name for a concave ceiling, having a semicircular or any other curve at every section; according to its supposed derivation from the It. *cupo*, meaning 'deep'. In this sense—and also in the sense of the external appearance of a vault forming such a ceiling or roof, and thence of a roof itself, if of corresponding shape, with or without such a ceiling under it—it has been so generally superseded by another term, that reference must be made to the article DOME. Cupola, indeed, as applied in these significations, is still sometimes used for a dome that is small, *i. e.* under 20 ft. in diameter, as for the hemispherical or similar roof to the lantern over the eye of a large cupola or dome, and for the lantern itself: this last employment of the word has a date so early as to render it almost technically proper. Thus FLORIO, *World of Words*, 4to., London, 1598, gives 'cupola, a spire-steeple'; *cuppola*, a chapel or a church; *cuppula*, a spire-steeple: SKINNER, *Etym. Angl.*, fol., London, 1671, says 'cupola or *cuppola*, a round tower vaulted', in which several other authorities concur: LITTLETON, *Dict.*, 4to., London, 1678, has 'cupolo or *loover*, a little turret': and CONNELLY, *Dict.*, 4to., Madrid, 1797, besides explaining that *cupola* means the termination of a dome, adds that according to some it is the dome itself.

1. 2. 4. 5.

ARCH. PUB. SOC.

CUPRESSUS. The Cypress. A coniferous genus of timber plants, distinguished at the first glance from the firs and pines by its leaves being mere scales.

C. *fastigiata* or *sempervirens*; upright, pyramidal, Oriental, or common cypress, is less hardy than the

C. *horizontalis*, spreading cypress, both of which are natives of the warm parts of Europe: both are said to have supplied the cedar-timber or gopher-wood of the ancients, but the latter may have been the *thuya articulata*. Both these varieties give a fine-grained, fragrant, very durable timber, resisting the worm and putrefaction. It does not rift or cleave, but with great violence. It is asserted that the doors of S. Peter's at Rome were the gift of Constantine, and that on their being replaced by bronze ones they were perfectly free from decay, though six hundred years old, and retained within part of their original odour. The doors of this wood, to S. Ambrogio at Milan, are said to date 1375-95.

The first named tree, from its gloomy appearance, and use perhaps for coffins by the Athenians and Egyptians, became dedicated to Pluto, and an emblem of mourning; it attains a size fit for planks as soon as the oak, and a height of 30 or 40 ft.; it is free from the defect, observed in the Virginia cedar, of cracking at the insertion of the limbs. The root of the wilder kind of Cypress is of great beauty, arising from its crisped undulations. ABIES. CEDAR. THUYA.

C. *Lawsoniana* attains the height of 100 ft. with a stem of 2 ft. in diameter, and supplies a good, clear, and workable timber. It is found in the valleys among the range of hills running between the coast range and the Rocky mountains in California.

C. *thyoides*, white cedar. A tree growing to perfection within fifty miles of the sea, between Connecticut and Savannah in North America, on wet soil, such as that of the marshes in New Jersey, Maryland, and Virginia, where it attains a height of 70 or 80 ft., but is rarely seen more than 3 ft. in diameter; the growth is slow, being about 8 ins. diameter to a plant fifty years old; and the wood is light, soft, rosy-hued, fine-grained, and easily wrought. It resists alternations of dryness and moisture better than any other species, is more secure from worms than the white pine, and was therefore preferred to the bald cypress (*Taxodium*) for shingles called juniper shingles at Alexandria, Baltimore, and Philadelphia, where (1817) this white cedar was no longer employed for the frames of houses, large timber having become rare except in the forest-swamps. It is now considered inferior to the JUNIPERUS Virginiana, red cedar, but is still used for shingles and interior finishings, and railway sleepers, for the reasons above given. Indeed the white cedar of New York, New Jersey, and Pennsylvania, is called juniper in Maryland, Virginia, and North Carolina; while what is termed white cedar in Boston, Vermont, New Hampshire, and further north, is really *thuya occidentalis*, the arbor vitae. HOLTZAPFEL, *Woods*; TREBOOLD, *Carpentry*. 71. 90.

C. *disticha*, bald cypress, see TAXODIUM.

CURACY, see CHAPEL OF EASE, DISTRICT CHURCH, ENDOWED PUBLIC CHAPEL, PAROCHIAL CHAPEL, etc., PARSONAGE, PERPETUAL CURACY, etc.

CURATORES AQUARUM (called at Constantinople consularis aquarum), OPERUM PUBLICORUM, et VIARUM. The inspectors of the aqueducts, public buildings, and roads of the Roman dominions. The duties appear to have been discharged by the censors and by the *ÆDILES*; but from the sixth century of Rome the inspectors of the roads were the *quatuorviri* and *duumviri viarum* until the close of the republic, when the curatorship was a post given to distinguished persons, and so continued until the end of the empire. A full account of the officers and servants employed by these inspectors or curators, who let the works upon tenders made by contractors (*manicipes*), may be gathered from LIVY, iv, 22, ix, 29 and 43, xxiv, 18, xxix, 37, xxxix, 2 and 44, xl, 46 and 51, xlii, 3, xliii, 16, xlv, 16, xlv, 15; CICERO, *Orat. in Verr.*, i, 48-59, *De Leg.*, iii, 3; POLYBIUS, vi, 13; PLINY, *Ep.*, v, 15; FRONTINUS, *De Aqueductibus*, 8vo., Altona, 1792; BERGIER, *Histoire des grands Chemins*, 4to., Paris, 1628, or in Latin with notes by Henninius in GRAVIUS, *Thes. Ant. Rom.*, fol., Leyden, 1694, x, 1; and SCHUBERT, *De Rom. Ædificibus*, 8vo., Königsburg, 1828, pp. 474-87, 547-52. PONTIFICES.

CURB or KERB. A word used in the sense of a restraint, except in the case of a 'curb of lead', which is the flashing or apron over the curb plate to a curb roof. Thus the term curb is used for the edging, which was originally made of timber, to



pavement; the coping of an area wall being often called a curb, perhaps from the employment of a timber plate when only wooden railings to areas were in use. For the curb of a footway, Scotch granite from 7½ to 12 ins. or more in width, is the material at present used almost invariably in London; it answers fairly where not exposed to a wear that will polish it: a less width than 7½ ins. is sometimes used, but is liable to fracture when carts are backed against it. For the curb of an area wall, standing above the level of a footway, brickwork either plain or covered with cement has been employed; and still more generally stone, which is speedily ruined where wrought iron railing bars set close are let into it and run with lead; a cast iron curb is now much used, as in the Regent's Park, London. The edge, to a brick or tile step, is also called a curb, even if it be merely a stone or timber nosing running into the wall at each end, or returned on one side with the step. CORDONATA.

The name curb is also given to an assemblage of three or more pieces of timber forming a frame round an opening, and so fastened together as not to be liable to separation; to the woodwork forming the arris of a plaster-work groin where a vault enters another vault or a plane; to the rim (Sp. *arcen*) of a well; to the frame of a well in which the door or cover is hung; to the plates forming the top of the sides of a greenhouse; the foundation of a dome, and even of its drum; the boundary of the eye of the dome; the base of a cupola, a lantern, or a skylight, these are all called curbs. CHAIN. CILL.

CURB is also the wooden ring on which the bricks forming the STEINING or lining of a well are placed, to keep them level as the earth is excavated beneath them, and as they descend by their own weight. Plain curbs are generally made of two thicknesses of inch elm board nailed together so as to break joint. If the earth is liable to cave in or slip, a barrel curb is necessary. This is formed of two or more plain curbs about two or three feet apart, and joined together by strips of inch board so as to form a species of drum. In this the bricks are placed which form the lower part of the steining. A. A.

CURB PLATE, RAFTER, and ROOF. The curb roof, common in London where workshops abound, resembles in section that given at A, although the name is usually given to the MANSARD roof shewn in section at B: the name in both cases doubtless arose from the plate, *a*, at the junction (Fr. *brisis*) of the two planes of the roof being called a curb plate, from its making the foundation and tie, for the upper part of the roof. The uppermost rafters are improperly called the curb rafters, whereas the plane, *a b*, is popularly called the curb.

CURF or KERF. The name given to the incision made by a saw in any material.

CURF, IN BRICKMAKING. A square heap of common earth, loosely made up, and exposed to the action of frost and weather in order that it may become more plastic. BRICK, p. 138. A. A.

CURIA. The name given by the Romans to buildings for various purposes, all of which, however, tended to the cure (care) of some person or thing. Each of the thirty wards or groups amongst which the Roman families were distributed by Romulus was a curia, and, as a corporation, had its peculiar place of assembly; the building so used was called a curia. There is the precise statement of VARRO, *De L. L.*, 8vo., Göttingen, 1833, v. 155, that curiæ were of two sorts, one where the priests looked after sacred things; the other where the senate attended to human affairs. From the latter, apparently, the custom arose of giving the name curia to the Italian local senates, and to their council-chambers. No example of a curia in a good state of preservation is known: the three columns usually supposed to have been part of a temple to Jupiter Stator at Rome are now attributed, on the authority of DION. CASS. and the inscription at Ancyra, to the curia Julia; but by

BUNSEN, to the temple of Minerva Chalcidica connected with it. The name of curia has been generally given to the three buildings, much resembling each other in size and plan, at the south end of the Forum in Pompeii. VITRUVIUS, v. 2, says little more about the curia than that if square on plan it should be a diameter and a half in height, but if oblong the height should be half the sum of the length and breadth; and that the walls should be divided at half their height by a cornice to check the progress of sound, and prevent resonance.

By the late Latin writers curia has been applied to many matters, in all of which care is implied; as an ecclesiastical cure; a manor with its privileges; a cage for wild beasts; and about 1150 the phrase curia Romana, a reminiscence of the senatorial body, expressed the papal court, as in later times mention is made of the court of Versailles, of Berlin, etc. The application of the word curia to a tribunal was natural in times when the sovereign, the prelate, and the lord of the manor, in their court, i. e. surrounded by their officers, administered the law sometimes in a court, i. e. an open yard. SPELMAN, *Glossary*, fol., London, 1687.

CURL. The natural varieties of continuous wavy figure seen on the face of a plank of mahogany, rosewood, walnut, etc.: the patterns of oak, satinwood, etc., being termed FIGURE.

CURLED MAPLE WOOD, see ACER.

CURLING STUFF. When the fibres of a stem or branch have wound or coiled, a sort of CROSS GRAINED STUFF is formed, which requires the use of the double-iron plane in working, and is mentioned by this name: the terms curl and cross grain are then synonyms. 1. 4.

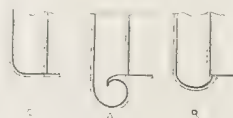
CURRIA or TORA, see CHIRRIA.

CURSOLA, CURZOLA, CORZOLA, or CURZOLO (in Slavonic, Korzul, the ancient Corecra Melana or Corecra Nigra). A maritime city in the island of the same name, belonging to the circle of Ragusa in the Austrian dominions. The city, triangular in plan, is enclosed by half-ruined walls and towers built 1420, and about half a mile in circuit. The town consists of right angled streets leading to a piazza at the apex of the triangle, having a handsome cathedral, erected in a Pointed style, with a noble campanile which, like the houses, is built of the local marble. Opposite to this is the palace of the former Venetian governors. Outside the walls are two picturesquely seated monasteries. 26. 50. 96.

CUSOR. The slide and sliding point of a beam compass. The axis of proportional compasses. 1.

CURSTABLE. An old form of writing COURSE-TABLE.

CURTAIL. The appellation given to the end of a handrail or of a step, which in plan returns with a curve towards itself and finishes as a scroll, either abruptly or on the head of a



newel. If the latter mode be adopted, the newel generally stands upon a curtail step, as at A, which is more showy than the BULL NOSE step, B, while both are preferred to the rounded corner step, C.

Curtail steps, double, treble, etc., are employed in handsome staircases. The best method of setting out such steps is given in ASHFITEL, *Handrails*, etc., 4to., London, 1851. The curtail step can only be applied to a cut string staircase.

CURTAIN. A name, derived from the Latin *cohors* and connected with the English word 'court', which is used in two senses. First, for the part of a wall constructed between two piers, buttresses, or bastions; second, for a partition between two rooms, or a temporary division in one room.

The curtain is an important feature in some buildings, sacred and secular, both in ancient and modern times. PAUSANIAS, *Desc.*, v. xii, mentioning the temple at Olympia, leads to the supposition that a curtain of rich material usually hung before the statues of divinities. "The linen curtain ornamented with Assyrian embroidery and of Tyrian purple, which is seen (in

the temple) at Olympia, was presented to the god (Jupiter) by Antiochus. This curtain is not drawn up towards the roof, as that of Artemis at Ephesus, but it is lowered down by loosening the cords." PLUTARCH, *Pericles*, 12, enumerates the artisans employed under the direction of Phidias, and mentions the *Πακιδται*, who were weavers of variegated stuffs, embroiderers, whose tapestries (*παπατασματα*) must not be forgotten, observes MÜLLER, "when we wish to call up the idea of the total impression of their temples and ivory statues." Acesas and Helicon, the Salaminians from Cyprus, weaved magnificent tapestries for the Apollo in the temple at Delphi. This art was practised in an especial manner in Phœnicia, Cyprus, and Carthage. Of the same class was Hiram's curtain before the Holy of Holies.

The curtain or drop, as it is called, closes in the modern theatres the stage from the audience at the end of an act or piece. It used originally to be merely a green curtain, let fall when one division of the dramatic representation was ended, and raised when another commenced. In process of time, instead of a baize curtain, a canvas one was used, painted in ample folds and with rich colours, and with various embellishments. Subsequently the drop curtain represented a landscape, noble hall, or any other magnificent feature, abundantly decorated. It is not known whether the ancients had any such arrangement in their theatres; and, in fact, it is one of those questions still unsolved, as to whether there was any roof to the stage, which may occasionally have been the case; and whether, if there was a drop, it was let fall or drawn up at the close of the act.

Propositions have been made to form the drop curtains to theatres of unflammable and incombustible materials, so as to effectually cut off the spread of fire from one part of the house to the other, should that calamity occur: a precaution but too often necessary.

T. L. D.

**CURTILAGE** (in late Latin, *curtilagium*, *curtilum*; Fr. *courtîl*). A small court, whether used as a yard or as a garden; SPELMAN, *Gloss.*, fol., London, 1687. In the description of Richmond written 1501-2, and given in GROSE, *Antiq. Rep.*, 4to., Lond., 1808, ii, p. 314-5\*, the great courtyard is called a curtilage.

**CURUPAS**. The native name for a tree found in the woods of Penang, giving timber of a dark red colour, used for beams in house building.

71.

**CURVED RIB ROOF**, see BENT TIMBER; FLITCH TRUSS; PLANKED TRUSS.

**CURVOGRAPH**, see CYCLOGRAPH.

**CUSHION** (Fr. *coussinet*). A stone lying on the impost or top of a pier, being the springer of an arch.

5. 25.

**CUSHION** or BOLSTER-WORK, see PULVINATION.

**CUSHION CAPITAL**. A term proposed by WHEWELL, *Architectural Notes*, 8vo., Cambridge, 1842, p. 71, who observes: "The capitals which I have distinguished by this term are extremely common in Romanesque work both in England and in Germany. They consist of large cubical masses projecting considerably over the shaft of the column, and rounded off at the lower corners. Sometimes they are cleft below, so as to approach in form to two or more such round-cornered masses. They may be considered as rude imitations of the very projecting ovolo and thick abacus which compose the capital of the Grecian Doric", or as an imitation of cases in which such ancient capitals have been cut off by a straight plane on each side, to fit mediæval work: a suggestion which appears untenable.

The same name has also been proposed for capitals projecting as double corbels. The projection is usually from front to back, but in some cases it is used in the direction of the wall, as in several examples shewn in the *Illustrations*, s. v. Capital. In most cases, where the corbels face the front of the wall, the cushion has a certain degree of resemblance to the square block crowning the capitals of columns in the churches at Ravenna of the fifth and sixth centuries, and in the early churches at Rome; but in these latter there is more refine-

ARCH. PUB. SOC.

ment than in the plain corbelled work of the early cushion, as it is seen in some of the Italian campanili, in some French examples, and in some of the English churches, as shewn in



the following examples: A, S. Peter in Gowts, Lincoln; B and C, Coleby, Lincolnshire, which are probably of the eleventh or twelfth century; but there are other and earlier examples with the baluster column and cushion capital at least as old as the tenth century. In Germany there are many examples similar to the earlier as well as to the Lincolnshire specimens; P'ANSON, *Detached Essay*, CAMPANILE.

The name is also given to a capital presenting somewhat the appearance of a cushion pressed down by the weight it has to support. Alone, or below corbels, which render the whole composition akin to the Lincolnshire and other examples above cited, it frequently occurs in early Indian works, in which some of the BALUSTER COLUMNS might almost be called cushion columns; good examples are given in FERGUSON, *Rock-cut Temples*, fol., London, 1845.

**CUSHION RAFTER**, see AUXILIARY RAFTER; PRINCIPAL BRACE.

**CUSP**. The projecting point formed by scalloped work or its imitation in any style; but the term is generally considered to be chiefly applied to the point produced by a pair of foils or lobes in mediæval arches and tracery. This application of the word seems to have been introduced by HALL, *Essay*, 8vo., Lond., 1813; whereas RICKMAN, *Attempt*, 8vo., 1819, wrongly transferred it to each feathering, foil, or lobe, although he rightly spoke of lobes as double feathered in some cases. The adjective is 'cuspidated', although 'cusped' and 'cuspat' are employed. WILLIS, *Arch. Nom.*, 4to., Cambridge, 1844, suggests that the mediæval name was *genouil*. The origin of the cusp, as a feature of the openings in Pointed architecture, is supposed to be Saracenic. From the end of the First Pointed period the cusp frequently presents a head, flower, or leaf (generally a trefoil), either as a cover or an extension of the cusp. The cusp, at first made on the wall face of the jamb, was afterwards let into the soffit, and after the Geometric period was taken out of the chamfer.

**CUSTOMARY MEASURE**. The name by which different values of an integral measure are frequently mentioned: the perch, pole, or rod, in Bridport measure was 15 ft., and in Ruislip measure 18 ft. long; while in the statute measure it is 16 ft. 6 ins.; in Cunningham or Scotch measure 18 ft. 9 ins., and in plantation or Irish measure 21 ft. long. Tables for the conversion of these last measures are given in LANKTREE, *Land Valuation*, 8vo., Dublin, 1853, pp. 41, 82-9. ACRE.

**CUSTOM HOUSE** (It. *dogana*; Sp. *aduana*; Fr. *douane*; Ger. *zollhaus*). A building intended for the examination of goods passing the frontier of a country or of a town, and for receiving the duties imposed thereon. It should contain large warehouses for examination, weighing, and stowage of merchandise, with proper cranes, lifts, etc.; waiting rooms, rooms for clerks, comptrollers, commissioners, etc. From the magnitude of daily operations, some custom houses, especially in England, are more the offices of the authorities and their clerks than places for inspection and temporary detention.

**CUSTOS**, see CURATOIRES.

**CUT BRACKET**. A piece of thin board formed with a profile resembling that of a corbel, and fastened under a shelf, or under the returned nosing of each step on the outer string of a wooden staircase. ASHPITEL, *Handrail*, etc., 4to., London, 1851. BRACKETING.

**CUTCHERY**, properly *kachahri*. The name given in India to the open area in which the courtiers, etc., had audience of the native princes; BUCHANAN, *Journey*, 4to., London, 1807, i, 45, s. v. MAHAL; to a court of justice; and to the business room of a civil officer.

**CUT IN**. A term used in house painting and in measuring

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such work, to express the preserving of a clean and defined edge in small surfaces, as moldings, lines, etc., where painted of different colours; from the labour required to do this properly, such work is charged by a running dimension. H. B. G.

**CUT ROOF.** A roof that has the appearance of having the part above the collars or straining pieces cut away: a good example is that over the chapel at Greenwich Hospital.

**CUT SPLAY.** The name given to the oblique cutting of corners of bricks in walling; as in the cases of gables to receive coping or cresting, reveals to windows and doorways, etc.

**CUT STANDARD.** The solid side or cheek into which shelves are housed, as those of a dresser, bookcase, etc. The outer edge or profile is 'cut' to some ornamental line or design, according as the shelves diminish in width. H. B. G.

**CUT STONE** or **HEWN STONE.** A name sometimes given instead of wrought stone, when the material has been reduced to an intended form by the chisel.

**CUT STRING STAIRS.** Stairs in which the outer string is cut to the profile of the steps; the treads are on the top of the string, and the moldings are mitred, and returned; the riser is mitred to the string. This term is used in contradistinction to **CLOSE STRING STAIRS**, in which the steps and risers are housed into the strings. A. A.

**CUTTACK CAVES**, in Hindostan, see **KHANDAGIRI**.

**CUTTERS.** The finest or first marl or malm bricks, principally used for arches of doorways and windows, quoins, etc., and which admit of being cut by reason of their evenness of texture and colour throughout their composition, and of being rubbed to their proper dimensions and form. **BRICK**, p. 140. 1.

**CUTTING COLOUR.** A colour laid, without shading or softening off, upon another colour. 4.

**CUTTINGS.** In brickwork, where walls join each other at oblique angles, or where, as on gables, it is necessary to cut the bricks with the trowel to make angles fair, or to receive coping, etc., these are called *cuttings*, and are generally measured by the foot run. **BIRD'S MOUTH**; **RAKE**; **RAMP**; **SKREW-QUOIN**; etc., etc. A. A.

**CUVILLERS** (**FRANÇOIS DE**), also **CUVILLIER**, **COUVILLERS**, and many other spellings, and with or without the prefix **DE**, was born 1698 at Soissons. He became architect to the landgrave of Hesse Cassel; and was chiefly employed by Charles VII, elector of Bavaria, for whom he designed Amalienburg, Badenburg, Pagodenburg, and the hermitage in the Nymphenburg gardens; and in Munich the theatre of the palace, the Wilhelm palace in Schwaburger strasse (these two are the opera and the academy?) and 1767 the façade of the church of S. Cajetan. He died in that city (some say 1760) 1768.

His son, of the same names, born 1734, was a captain of engineers, and electoral architect at Munich, where he erected the guard-house (*haupt-wache*) and the new buildings in the Angen-viertel; and designed the fine flight of stairs in the Nymphenburg. He published one or two collections of designs by his father and by himself, under the titles of the *Vitruvo Bavarois*, and *Sammlung* or *Euvres*, in at least 318 plates, fol., 1769-72. He died 1770. **WESTENRIEDER**, *Beschreibung*, 8vo., Munich, 1782.

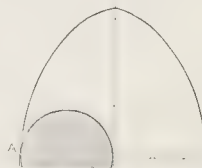
**CUZCO.** An old city in the department of the same name in Peru. Its stone houses, with roofs of red tiles and spacious apartments, are richly decorated. The cathedral, erected 1534 and dedicated to the Assumption of the Virgin; the episcopal palace; the four parish churches, and as many monasteries; three nunneries, and as many hospitals; the university; and the *seminario*, are interesting; but less so than the ruins of the structures erected by the ancient inhabitants. The new buildings can hardly be judged from the illustrations given in **MARKHAM**, *Cuzco*, 8vo., London, 1856, who enters into a traditional history of each of the old remains and ruins; these are intelligible with the aid of a map given p. 302 in **Tschudi** and **RIVERO**, *Antigüedades*, 4to., Vienna, 1851, who besides folio plates showing the remnant of the celebrated temple to the sun,

of the fortress **Sacsahuaman**, built on a hill commanding the city, and of the palace **Collecampata** (with its doorways diminishing upwards) at S. Cristoval, a suburban parish, etc., gives p. 306 a vignette of enormous irregular masses of freestone that were generally employed, the interstices being so truly filled by smaller stones that the joints are hardly perceptible; the dimensions of one block are given 15 ft. by 12 ft. and 6 ft. Sketches of the walls are given in **FERGUSSON**, *Handbook*, i, 154-60.

**CYANÆ.** The ancient name of a city or league of small towns now represented by Ghiouristan, Tousa, and Yarvoo, between the head of port Tristomo and the valley of Cassaba in the south of Asia Minor. These villages are named according to their position from north to south, Tousa being rather to the west and the necropolis to the east. Tousa is chiefly remarkable for a wall of blocks partly unhewn, partly polygonal. Yarvoo, evidently the acropolis, exhibits the remains, from 5 to 15 ft. high, of walls, besides heaps of ruins, inclusive of a theatre 165 ft. in diameter, tombs, sarcophagi, etc. A plan of the theatre is given in **SPRATT** and **FORBES**, *Lycia*, 8vo., London, 1847, i, 111, ii, 271. **LEAKE**, *Asia Minor*, 8vo., London, 1824, p. 188, gives the account by the discoverer, Mr. Cocke-rell, of the site and name. **TEXIER**, *Asie Mineure*, fol., Paris, 1839, iii, 205, pl. 210-11, gives two Lycian rock-cut tombs with interesting details, and a Lycian house, like those at **APERLÆ**, about 23 ft. long and 21 ft. wide, with walls of polygonal masonry.

**CYCLOGRAPH.** The name given not only to Lowry's machine for describing circles, but to instruments for drawing without centres arcs of circles to any chord or versed sine. Besides the workman's triangle moving against two points and marking the required arc by its apex, more delicate yet similar instruments have been invented for the draughtsman, and are described in the **SOCIETY OF ARTS' Transactions**, xxxii, 67; xxxiii, 69 (Nicholson's centrolinead); xxxix, 49 (Rotch's arco-graph); and xlii, 151 (Alderson's curvilinead): xxxv, 109 (Warcup's curvograph), describes a variation of the whalebone or metal bow-and-string worked by screws, which has been mentioned s. v. **BEVEL**. **CYMAGRAPH**. 14.

**CYCLOIDAL ARCH.** The name given to an arch which, as in the accompanying figure, has the section of a cycloid for the line of its intrados; **MURPHY**, *Plans, etc., of Batalha*, fol., London, 1795, pl. 1, fig. 13. It is formed by the progress of the fixed point, A, on a disk, in its revolution upward on the centre line of



the opening.

**CYCLOPEAN MASONRY** is an expression used, as well as the term **Pelasgic**, to indicate the rude and generally polygonal or irregular construction employed by the primitive Greeks and the early Greek settlers in Italy, who for self-defence, surrounded as they were by rivals or enemies, and accustomed to live in cities, encircled them by those walls called either Cyclopean or Pelasgic, as *κυκλωπεὶ οἰκίσματα τεῖχιν*; **EURIPIDES**, *Electra*, 1152. This mode of construction is mostly confined to city and terrace walls, the only known example of its introduction in an edifice being the temple at Rhamnus (**INEDIT ANTIQUITIES OF ATTICA**). It consists of a piling up of huge blocks of stone, the weight of which gave them sufficient stability to resist the thrust of the earth behind; for there was not any mortar or cement employed, nor any plug, dowel, or clamp, to bind them artificially together. These constructions may be classified under four distinct periods, illustrating the process from the most rude combinations to the regular isodorum and pseudisodorum of refined masonry.

The first consisted of vast unshapen masses piled one upon another without order, the interstices filled up with pebbles

and small stones. The openings in such walls were formed by the stones gradually overhanging and cut to the shape. The walls and gates of Tiryns, and the acropolis of Mycenæ, eminently of the heroic periods, as also terrace walls at Delphi, and the city walls of Norba in Italy, illustrate this first division.

The second presented a masonry of polygonal hewn blocks, cut to fit each other, and some of the interstices and open points filled in also with pebbles. Of such are the acropolis walls of Gortys and Daulia and the cella wall of the temple at Rhamnus, and a portion of the walls at Norba.

The third period was of a broken coursed trapezoidal appearance. The Greeks then began to form horizontal courses of beds not running quite through in a line to any considerable distance. Sometimes two courses would be equal in height to one immediately adjoining. The joints were not vertical; the stones were of irregular sizes, and sometimes were interspersed with polygonal blocks. A portion of the walls at Mycenæ, and the pyx at Athens are of this character.

The fourth and last period is of a continuous coursed trapezoidal arrangement, the beds continued horizontally throughout, but the joints rarely vertical. The upper parts of large apertures are formed by oversailing courses cut to the straight inclined line, but for the less openings a square-headed lintel. At the angles of towers there were occasionally kinds of double rebates. The treasury of Atreus at Mycenæ, the walls of Mes-saloggion, and at Thoricus, well illustrate this class. MÜLLER, translated by LEITCH, *Ancient Art and its Remains*, 8vo., Lond., 1847, 1st ed., p. 20; GELL, *Itin. of Greece*, 4to., Lond., 1810; Signora DIONIGI, *Viaggi, etc., del Lazio*, fol., Rome, 1809; CANINA, *Works*; HAMILTON, in the *Archæologia*, xv, 315. T. L. D.

The term is derived from legends of the Cyclopes, not the Sicilian Giants mentioned by HOMER, but a tribe which took its name from its king Cyclops, was expelled from Thrace (according to the Scholiast on EURIPIDES, *Orestes*, 953), went to Crete and Lycia (STRABO, viii), and was taken from the last named country about (1379 A.C.) six generations before the Trojan war, by Prætus the great grandson of Danaus, to construct the fortress of Tiryns with vast unhewn blocks laid in walls about 25 ft. thick, having the interstices filled with smaller stones, as carefully specified by PAUSANIAS, *Descr.*, ii, 16 and 25, vii, 25.

The term Cyclopean building has been extended so far as to have no more precise meaning than ancient construction with huge materials, in which the face of the wall exhibits blocks either rude, or as described by PAUSANIAS, or roughly polygonal, or carefully wrought polygonal, or quadrilateral showing the ends more or less inclined to the upright beds, or rectangular of varying sizes and courses. Indeed DENNIS, *Cities*, etc., 8vo., London, 1848, ii, 281, observes very truly that PAUSANIAS applies the term Cyclopean "to the walls of Mycenæ, which are of hewn polygonal blocks, and even to the celebrated gate of the lions, which is of regular squared masonry. The term is also repeatedly used by EURIPIDES in reference to the walls of Mycenæ and of Argos": and it is therefore clear, as DENNIS concludes, "that the term Cyclopean cannot with propriety be confined, as it has been by DODWELL and others, to masonry of the rudest description, in contradistinction to the neater polygonal, or to the horizontal style. The term was employed in reference to the traditions of the Greeks, rather than to the character of the masonry; or if used in that way it was generic, not specific; applicable to any walling of great massiveness which had the appearance, or the reputation, of high antiquity." It is equally clear that it is impossible to defend the application of the term to other works than those to which a Greek would have applied it, even under the plea of their being executed *more Cycloporum*; for if used in that sense it must be accompanied with details as to material and workmanship, in which case it is surplussage; or if left unexplained, it is vague and tends to confusion. POLYGONAL WALLING.

ARCH. PUB. SOC.

CYCLOSTYLAR. A term applied to a structure consisting of columns arranged on a circular plan without any central mass; if such a mass existed it would be a peristyle. COLONNADE.

CYLINDER, as applied in foundations. The large number of bridges and other hydraulic constructions required by the development of the railway system, has led to some unexpected applications of the science of pneumatics to the execution of foundations under water. As far back as 1778 COULOMB published a *Mémoire* in the *Transactions* of the Académie des Sciences of Paris, under the title of *Recherches sur les moyens d'exécuter sous l'eau toutes sortes de Travaux Hydrauliques*; and one of the most able of the French engineers of the present day, M. de la Gournerie, applied a modification of Coulomb's system at the port of Croisic, in the years 1844-48, which he has himself described in a *Mémoire* inserted in the *Annales des Ponts et Chaussées* for the latter year (1848). Dr. Potts patented, about the same period, in this country, a pneumatic process for sinking foundations, which was successfully applied, amongst other places, in the construction of some bridges on the Chester and Holyhead, and upon the Richmond branch of the South-Western, railways. More recently Mr. John Hughes introduced what he described as the "pneumatic method of constructing foundations" as applied by himself, under the directions of Sir William Cubitt, in the Rochester bridge. In all these works cylinders or other shaped air tight cases were used under peculiar conditions; but in India the system of founding large masses of masonry on cylindrical piers built in the interior of wooden curbs, seems to have prevailed for a very long time. It will be found recently described by Mr. G. B. BRUCE in the *Transactions of the Institution of Civil Engineers*, 1857, reprinted in the *CIVIL ENGINEER AND BUILDING NEWS Journals*.

The system applied by MM. Coulomb and De la Gournerie consists in a vessel which is floated over the position to be operated upon, and there sunk by being weighted. The workmen enter the working chamber, and place themselves upon an intermediate stage; the trapdoor through which they passed is then closed, and then by forcing in compressed air the water is removed from the working chamber so as to allow the workmen to carry on their operations as though they were above ground.

In Dr. Pott's system, which perhaps may be correctly described by saying that it consists in the application of pneumatic pressure to the descent of hollow piles or cylinders of any size and almost of any shape; the lower extremity of the cylinder or tube is open, and the upper extremity closed, excepting in the part from which the air is to be exhausted by the pumps. The cylinder is placed over the position it is intended to occupy, and the solid materials in the interior are removed as far as possible. The air is then withdrawn, and the atmospheric pressure upon the exposed upper surface causes the whole system to descend. Of course in such a process the power exercised by the weight of the air must depend firstly upon the perfection of the vacuum created, and secondly upon the surface exposed; so that, all other conditions being equal, the larger the cylinder the more easily will it be driven. But it must be remembered that if the cylinders be intended to act simply as piles, that is to say, to produce their resistance to descent by the friction exercised on their perimeter, there are motives of economy which should lead the architect to prefer the use of numerous small piles rather than that of a few large ones. In the bridges on the Holyhead line small piles were used; in those over the Thames the principal cylinders were 6 feet in diameter: in both cases the interiors of the cylinders were filled with concrete. The great advantage of Dr. Potts' system consists in the absence of any vibratory action upon the ground into which the cylinders are driven.

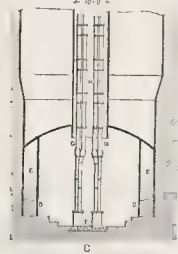
The principle upon which the foundations of the Rochester bridge were constructed is substantially the same as that applied by Messrs. Coulomb and De la Gournerie, and it may be briefly described as consisting in practically converting the hollow



piles (there used of 7 feet diameter) into diving bells, from whose interior the water was removed by compression of the air. There were many very ingenious contrivances adopted in this operation to facilitate the extraction of materials and the passage of workmen from one part of the apparatus to another; but the reader would better understand them by reference to the account printed (not yet published) by Mr. Hughes of this very remarkable and successful work.

The Indian method of using brick cylinders is precisely the same as that used in sinking the steining of ordinary wells. Wooden curbs are placed on the surface of a bed sunk to receive them, and on it the brickwork is carried up to a certain height, usually about 5 feet; the ground under the curb is then excavated from the interior, and the cylinder is allowed to descend by its own weight. This process is repeated until the required depth has been attained; and in cases when the cylinders are sunk below the water level, no precautions are even taken to remove the water, for the native Indians actually dive to their work. When the cylinders are sunk to the full intended depth, their interior is filled up with concrete or rubble masonry. The foundations of the great Solani aqueduct were formed in the manner described above; as detailed in the *JOURNAL OF GAS LIGHTING*, fol. London, 1858, p. 45; also the foundations of the piers of the viaduct across the river Poiney, in Arcot, on the Madras railway, as detailed in the *ILLUSTRATED LONDON NEWS*, 1857, xxxi, 580. The tower-staircases of the Thames Tunnel, London, were built on the ground, and sunk according to the Indian method of using brick cylinders.

The accompanying wood-cuts illustrate the cylinder used 1855-7, in building the piers of the Royal Albert bridge at Saltash, on the Cornwall railway. The large external cylinder, 37 ft. diameter and 100 ft. in length, was built on a slip like a ship, and launched end foremost, sufficient water being admitted to allow it to stand upright in the water. It was then towed out to the centre of the river, and by the admission of more water made to drop into its place. The wood-cuts show the lower end of the large cylinder *in situ*. There is a dome or bell, the exterior part of which is divided into cells or air-jackets, E. From these the water was pumped out, and men admitted into them by means of a pipe 2 ft. diameter (not shewn in the wood-cut), but which was inserted into one



jacket through the 10 ft. cylinder, H. All the cells, communicating with each other, were so many diving-bells in which the men worked, excavating a footing in the rock for the large cylinder. When this was done all round, a ring of brickwork, D, was built, in order to strengthen the cylinder so as to admit of the water being pumped out of the central portion, which was strutted, F, F, as in B. This being effected, sand bags were rammed into every crevice, and concrete laid in, upon which granite masonry was built to its proper height, whilst the pumps, A, G, kept the cylinder perfectly dry. The iron of these pumps, which was built into the masonry, was cut away. The mud at the bottom of the river helped the operation by keeping the water out and steadying the cylinder. The details of floating the tubes for this bridge are given in the *BUILDER* and other Journals for 1858.

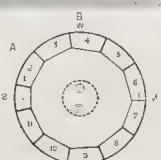
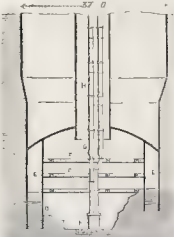


FIG. 1. Lower end of the large cylinder in situ, showing the dome or bell structure divided into cells or air-jackets, labeled E.

G. R. B.

CYLINDER. The form into which sheet glass is blown, which subsequently is cut open and flattened. It is also called a 'muff.'

CYLINDER, used in the construction of VAULTING; FLOORING; ROOFING, etc. See also FIREPROOF CONSTRUCTION; and POT.

CYLINDER in Joinery. A sort of core constructed of deal planed up carefully to fit the well-hole of a staircase. Upon this as a mold the lines are traced, and the wreathed string and the wreaths of the handrail are laid, and glued on each other, as it is called, in "thickness".

CYLINDRICAL, also called BARREL or CRADLE, VAULTING (Fr. *voute en berceau*). A vault, straight or curved on its plan, that should be semicircular, i.e., the half of a cylinder, in section; of equal height and diameter throughout, whether level or ramping; and long enough to make it superior in importance to any other vaults that may be groined into it. Sometimes all these conditions are not observed; thus the name has been improperly given to wagon-headed, elliptic, and to segmentally sectioned vaults. If pierced by vaults of similar section the groins are cylindro-cylindric. The same observations apply to the term cylindrical ceiling or cupola; but a cylindrical dome is understood to be spherical, as at the Pantheon, in opposition to a polygonal dome or vaulting, as at Sta. Maria del Fiore.

CYLING, see CEILING.

CYMA, also written CIMA, and thus confounded with the *sima* of VITRUVIUS as well as with the word *cymatium*. The name given to two different moldings. The term is derived by some authors from the Greek *κύμα*, 'a wave'; by others from the Latin *cyma*, 'the top of a plant.' In England it is applied singly or with the epithet 'recta' to the molding having its profile as A; (It. *gola*, *gola dritta*, *goletta*, the *gula intavolata* as the crowning member to an architrave, of PALLADIO; Sp. *gola*; Fr. *cimaïse*, *doucine*, *gorge*, *gueule*; Ger. *riemleiste*;) and in English it is also called cymatium and wave-molding: where the word *cyma* is also applied, but with the epithet 'reversa',



A, Cyma or cyma recta, or back ogee; B, Cyma reversa, or ogee; C, Inverted cyma recta; D, Inverted cyma reversa; E, Cymatium Lesbium (?); F, Cymatium Doricum.

to the molding having its profile as B (It. *gola rovescia*; Sp. *talón*; Fr. *gueule renversée*, *talón*; Ger. *kehleiste*); and GWILT, *Dict.*, s. v., says that both A and B are called ogees in this country, and C an inverted cyma reversa. For the moldings C and D there are no technical English names; C may be called an inverted cyma recta (Ger. *sturzrinne*), and D an inverted cyma reversa; the French workmen have called A, *doucine droite*; C, *doucine renversée*; B, *talón droit*; and D, *talón renversé*. The English carpenters call the cyma recta, a back ogee. CYMATIUM. SIMA.

CYMAGRAPH. An instrument invented by Professor Willis for obtaining, at full size, the profile of a molding or group of moldings, etc. It is described by him in the *CIVIL ENGINEER Journal*, 1842, v. 219. CYCLOGRAPH.

CYMATIUM (It. *cimasa*, *cimazio*; Sp. *cimazo*; Fr. *cimaïse*, *cymaïse*; Ger. *wulst*). A term derived through the Greek *κύματιον*, a little wave, applied to a capping molding for various portions of work in classic and neo-classic architecture. Thus besides its use in the cases which there will be occasion to cite from VITRUVIUS, this name is given to the cap of a modillion; to the upper molding of the subbase of a stylobate; and to the *sima*. Its employment in the last case is allowed by CHAMBERS, who explains cymatium by 'cyma recta' (fig. A, as above). French writers were probably the source of his error, which perhaps arose from the cyma recta having been a favourite cap-

# CAMPANILE.

## ILLUSTRATIONS.

Plates 1, 2, 13, 14, 15, 25, and 26.

CAMPANILE is the term appropriated to a certain class of towers, chiefly devoted to religious purposes in Italy. Whether in the Lombard or Romanesque style, or in that of the Revival, they form so conspicuous a feature in the country in which they are found, present so many points of interest, and are so suggestive of varied and beautiful ideas, that they can scarcely fail to have been the object of especial study, and attention, to the professional traveller.

Similar in purpose, to the superb belfry-towers of the north of Europe, though differing widely from them in style of art and design, they equal their rivals in point of dimensions and constructive skill; and, in many instances, are scarcely inferior to the finest examples of pointed architecture, in beauty of outline, and well-adjusted proportion of parts.

Although it must be admitted that the earlier styles to which, in many cases, they belong, are inferior in resources, and less adapted for producing the pyramidal, and gradually tapering, outline which has become predominant in this species of composition, so fully developed in the magnificent campanili of Cremona, Modena, and many other towns, particularly in Milan, Genoa, and their neighbourhood; nevertheless, amongst even the earliest and rudest of the works of this class, a beautiful simplicity of form and outline is found, so interesting and so remarkable, as to have been conventionally adopted by artists, as a leading feature in all Italian landscape scenery.

It is then to Italy, that the Architect naturally turns for examples, through which to trace the origin, and to elucidate the history, of the present subject of consideration. He finds that there is at Rome, and Ravenna, a large class of these monuments, evidently the most ancient, and used as the type for all later buildings of this description; at present, especially in Rome, these examples are incongruously mixed up with constructions, either of earlier, or more frequently of much later, date, so that it is difficult, by comparison with the edifices to which they are attached, to establish any proof of their age: these being, however, without doubt, the earliest campanili erected, it becomes easy, if a true date be assigned to them, to trace the after progress of other works of the same character.

It is to be observed, that these buildings present themselves, scarcely so much adjuncts to the church, as entirely new and principal features, intended for a particular purpose; and as it is obvious that the use of bells gave birth to them, the first point of enquiry is as to the reception of bells into the service of the Christian Church.

It seems universally admitted, that about A.D. 400, Paulinus, bishop of Nola, a city of Campania, was the first so to use them. The tintinnabula, subsequently introduced by Pope Leo I, A.D. 458, were so small, that six or eight of them could be rung on one wheel. In 605 it was formally appointed by Pope Sabastian, that the canonical hours should be distinguished by the ringing of bells, which, from that time, appear to have become more common. Pope Stephen III is said to have placed three bells in a tower on the old basilica of St. Peter's, in 752-757, and they were used in churches, by order of Pope John IX, about 900.

In England, bells were used, before the conclusion of the seventh century, in the monastic societies of Northumbria; and it is said, as early as the sixth, in those of Caledonia. INGULFUS mentions, that Turketulus, abbot of Croyland, who died

about 870, gave a great bell, which he called Guthlac, to the church of that abbey; and about a century later, six large bells were added, all of which rang together. In 950, S. Dunstan caused two large bells to be cast for the church at Reading; not long after this date, Kuseus, archbishop of York, gave two great bells to the church of S. John, at Beverly; and at the same time ordered, that other churches, in his diocese, should be provided with like appendages. Distinct mention of their constant use, in every parish church belonging to the Saxons, is found in the laws of Athelstan: so that it is not probable that in England we have any existing bell-tower, of earlier date than the time of Alfred the Great. BATISSIER (*Hist. de l'Art Monumentale*) asserts that the use of bells was known in France earlier than the seventh century: it is said as early as 550. MILLIN (*Dictionnaire des Beaux Arts*) cites the tower of S. Denis, near Paris, as one of the most ancient in France. The church to which it belongs, esteemed in that country as the greatest work of the seventh century, was commenced by Dagobert I, who died in 638, and continued by his son Clovis II, who died in 656. Pepin restored, or rebuilt, this abbey, which was consecrated by Charlemagne, in 775.

D'AGINCOURT says, that one of the existing towers of S. Germain-des-Prés, at Paris, is a construction of the sixth century. The abbey, at first called, "of S. Vincent", was built by Hildebert, in 550 (the bishop, S. Germain, being the Architect); and so remarkable and rich a church was it considered, that it obtained the title of S. Germain la Dorée. This church having been destroyed, or more probably much damaged, by the Normans, was rebuilt in 990.

There was an octagonal bell-tower, with semicircular arched openings of the sixth century, formerly standing in the garden of the Innocents, at Paris. In the reign of Charlemagne, 768-814, a monk named Fauchon was in much repute for his skill in bell-casting; but upon the whole, it would appear that the use of bells in France cannot have been general earlier than the end of the sixth, or beginning of the seventh century; for it is said, that in 610, the alarm caused by the noise of the bells of the church of S. Etienne, at Sens, put to flight the army of Clotaire II, then besieging that town; a circumstance which sufficiently proves, that the sound must at that place and time have been uncommon, although it also proves that the bells must have been of considerable size.

The dates above quoted, as to the first introduction of bells, it is admitted, rest for the most part on but slender authority; it may, however, be considered, as sufficiently established for the present purpose, that the use of bells was certainly not common before the seventh century.

Having thus endeavoured to find a starting point in the chronology of bell towers, reference may now be made to their architectural character, as our further guide in this investigation. If the age of the early campanili is to be decided by comparing them with structures of similar architectural character, nothing, perhaps, so closely resembles them as the building at Ravenna, called the Palace of Theodoric, which, if not of his time, 493-526, is probably not much later. This building is decorated with arches springing from capitals, which may be termed, as by Professor Whewell, "cushion capitals", projecting as double corbels, in the direction of the thickness of the wall, over them.

In the early campanili, this form of construction prevails, not

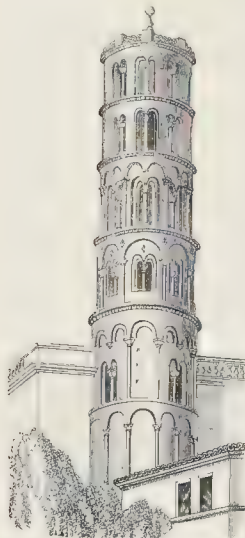


only in Italy, but in England, as, in some of the churches of Lincolnshire, from which three examples are here given; A,



from the church of S. Peter in Gowts, Lincoln; B and C, from Coleby church, furnish perfect examples. These buildings are probably of the eleventh or twelfth century; but we have

other and earlier examples with the balluster column and cushion capital, at least as old as the tenth century; but these do not so nearly resemble the campanili, as do the bell-towers of Lincoln. In Germany are many similar to the earlier as well as to the Lincolnshire examples. And in France, too, the feature is not wanting; the tower of the cathedral of Uzès (from a drawing by Mr. James Bell) is a very fine and illustrative example.



Cathedral, Uzès.

There is a certain resemblance in this cushion, to the square block which crowns the capitals of columns, in the churches of Ravenna, in the fifth and sixth centuries, and in the early churches of Rome; but in these capitals there is more refinement, than in the plain corbelled work of the early campanili.

Having alluded to these analogies in form, which help us to an approximate date, it may be well to consider what facts in history may be further fitted to elucidate this subject.

Upon the removal of the seat of empire to Constantinople, A.D. 328, art began to decline, and its fall was continual and rapid, until the extinction of the Western Empire. During the reign, however, of the Goths in Italy, and of the Lombards, from 500 to 772, although a period of great anarchy and confusion, architecture was encouraged, and several important works were executed, founded on the model of the debased works of latter Roman times; and it is to this period, that is to be attributed the erection of the early campanili of Rome and Ravenna.

Theodoric, who began his reign in 493, and sustained it for the then unusual space of thirty-two years, was especially careful to maintain the walls, and public buildings, of Rome. He established his capital at Ravenna, enriched it with several buildings, and had, probably, both more opportunity and more desire to promote the arts, than any other king, either of his own or the Lombard race.

HORÆ (*Hist. Essay*) states, in alluding to the immense basilicas built on the first burst of Christianity, that the only universal addition in Rome to the former sacred structures, was, after steeples had begun to spring up in the seventh and eighth centuries, that of one of those appendages to each of the old churches.

In the absence of positive dates, there does not appear any evidence why the campanili of Ravenna may not date back as far as the beginning of the sixth century; nor is there anything in their character, which should preclude their being as late as the end of the eighth, or beginning of the ninth, centuries; but it is not probable that they are later than 750, about which time Ravenna lost its importance, and ceased to be considered as the capital of Italy.

It may not be out of place to insert the dates, of the principal buildings at Ravenna, built before the seventh century:—

The Duomo, of the fourth century.

Sta. Agata Maggiore, completed A.D. 417

S. Giovanni della Sagra, built by Galla Placidia 425

S. Francesco, time of Galla Placidia 492 to 526

S. Apollinare Nuovo, time of Theodoric 493 to 525

S. Michele in Affricesco (?) 530

S. Vitale 534

S. Apollinare in Classe, built by order of Justinian, and consecrated by the archbishop Maximian, in 549

Although possessing square campanili,—for instance, that of S. Giovanni Evangelista (of the fifth century?), with articulations of white and green mosaics,—yet Ravenna presents



S. Giovanni Evangelista, Ravenna.



S. Giovanni Battista, Ravenna.

others, which, like S. Apollinare Nuovo and S. Giovanni Battista, are cylindrical in form, a feature in Italy peculiar to the campanili of this city, and which may very probably have arisen from its connexion with the seat of government in the East; indeed, the church of S. Vitale is recorded to have been built from designs furnished from Constantinople.

The campanili of Ravenna have all semicircular-headed openings, of precisely the same character as those of Sta. Maria in Cosmedin, at Rome, see Plate 15.

Having thus sought, by means of the campanili of Ravenna, to establish approximately the era of the earlier buildings of this class, it will not be difficult to give instances with more exact dates, tracing them through the various stages of that Art which began its revival under Charlemagne, 768-814, was continued by the Pisans, and rapidly spread throughout Italy.

Of the early campanili, may be cited that adjoining the church of S. Giorgio in Velabro, at Rome, and partly attached to the Arch of the Goldsmiths: it was built by Pope Zacharias, A.D. 741 to 752; and, "it merits attention, because it is of a style very common in Rome, and its date well ascertained."—Woods (*Letters*, etc.).

On the columns of the temple of Mars Ultor at Rome, there is a tower, which is supposed to be of the ninth century. Among



S. Apollinare, Ravenna.

other examples of a similar style, at Rome, are the following:—Sta. Maria, in Cosmedin, of which, as already stated, very



Sta. Francesca Romana, Rome. (A, marks half the height from the ground.)

ample illustrations are given in plate 15 (the church is of the date of 922); Sta. Croce di Gerusalemme; SS. Giovanni e Paolo; Sta. Clementina; S. Giovanni Laterano; S. Lorenzo in Lucina; S. Silvestro in Capite; Sta. Francesca Romana (a very fine specimen); S. Parenziano; the Basilica of S. Lorenzo (a small example); and, in the papal states, that of Sta. Scolastica, at Subiaco; all of the same character, and probably of the same age. They are all square towers of brick, the lower part plain, and the upper stories marked by string courses; each story has a greater or less number of small arches, with or without single columns as divisions, for windows. Medallions, sometimes of different kinds of marbles, as porphyry and serpentine, sometimes of terra cotta, ordinarily coloured bluish-green and glazed, are let into the walls of these towers as ornaments; and at the summit, immediately under the eaves, there is frequently a corbelled projecting canopy, with a niche for an image of the Virgin; a low roof completes the design.

After the campanili of Rome and Ravenna, those may next be noticed of the north of Italy. These present a considerable difference in architectural character. They are more marked by the vertical panneling; the string courses, usually flat, are very secondary features; the arcades are not perforated to the same extent; and the cushion capital is not used.

Out of the papal states, the campanili attached to the church of S. Michele, at Pavia (sixth to eighth century), with those in Murano and Torcello, may be quoted as Lombard works; and perhaps, also, that of S. Miniato, which was of great use to the Florentines, in the sieges of their city, as affording them the means of watching the movements of the assailants. It is of this tower that the story is told, which assigns to Michel Agnolo the credit of suspending woollen mattresses from the projecting cornices of the campanile, to intercept the heavy stone bullets which were being constantly thrown at it. The success is intimated, to visitors, by the heaps of balls remaining at the base of the building.

Four towers of principal reputation, deserve, also, honourable notice: they are those of S. Frediano, at Lucca, date about 1100, although heavy, yet very fine; of the cathedrals of Parma (brick), Piacenza (brick), and of Pietra Santa, which is called from its size a duomo, though not so, in real rank.

The campanile of the duomo at Siena was built about 1100, by the Bisdomini, and is consequently more ancient than the cathedral. The marble coating, and all its ornaments, are by Agostino and Angelo da Siena. It has some resemblance to that of S. Zenone, at Verona, begun by Abbot Albergio in 1045, and finished in 1178, which is entirely of brick. (Plate 26.)

At Ravenna, the campanile of Sta. Maria in Porta fuori, dates between the years 1110 and 1119: its base is supposed to be the remains of the ancient square pharos of the harbour. Similarly, the belfry of S. Maurizio Maggiore, at Milan, is traditionally supposed to have been one of the three hundred Roman towers which defended the city, and to have served as a prison for saints and martyrs; while a more modest claim is put forward, for the date of the campanile of the church at Villanuova (1250), between Verona and Vicenza: this has formerly been the feudal tower, part of the castle of the San Bonifazi; so, in like manner, just out of Vicenza, near the Porta del Consilio, the march-tower,

between Lombardy and the Venetian States, has been metamorphosed into the belfry of a church.

The tower on the piazza at Venice (the foundations of which were laid in 889, and the present walls begun in 1148, by an Architect named Buono), is three hundred and fifty feet high; but the arches in the upper part, with the story above them, and the spire, are said not to have been completed until 1517, under the design of another, his namesake, Bartolomeo Buono, of Bergamo.

At Este, the campanile, of high Romanesque antiquity, inclines as much as that of Pisa.

The campanile of the church Sta. Maria della Pieve, at Arezzo, is attributed to Marchione; yet this curious work, of five stories of columns, agreeing with his fantastic decoration of the façade of the church, is given by MILIZIA (*Lives, etc.*) to an Architect of the year 1300.

The campanile of Pisa, one of the four great belfries of Italy, was commenced by Gulielmo or Willelmus, an Architect of Innspruck, and Bonano, of Pisa, in 1174; and completed, by the addition of the eighth story, after 1345, by Tomaso, also a Pisan.

This is more usually called the "leaning tower": but this name does not convey a real notion of the bearing and form of the building. It is not a leaning tower, but a contorted or twisted tower. Like a tree, which, springing out of the shelving side of a rock, strives to become perpendicular, and bends its trunk by the force of vegetation—so similarly have the Architects, as they proceeded in the work, after the first sinking, endeavoured to right the building. The consequence has been, an irregular curvature in this great trunk, and an irregular connexion, of this irregular curvature, with straight lines, which no perspective view can represent satisfactorily, and which could not be shewn in a model, without the greatest attention and nicety.

This edifice is of marble, one hundred and seventy-seven feet ten inches in height, circular on the plan, and surrounded by two hundred columns, having arches instead of an entablature over the capitals. Its great renown has been earned, not by its beauty of design, nor rarity of material; but by a singular inclination of fifteen feet out of the perpendicular. Whilst constructing it, the Architects were not careful to sufficiently secure by piles, the foundation or ground-work; for before it was half completed, the walls gave way, which obliged them to strengthen the foundation on the inclining side with great promptitude. The clear lower diameter is twenty-four feet, and the thickness of the wall thirteen feet five inches. The upper diameter is twenty-five feet five inches, and the thickness of the wall nine feet. The lower or basement story, on the outside, has fifteen half columns attached to the wall: there are some slight ornaments inserted with mosaics, and a few sculptures. Above, are six stories, each formed by a peristyle of thirty columns, with a walk around, between them and the wall; and above these, another, which contains the seven heavy bells: making altogether eight ranges of columns, one above the other, including the ground story. There is a staircase of two hundred and ninety-three steps contrived in the thickness of the wall; and the interior is without floors, except one between the seventh and eighth stories. Almost all the towers of Pisa, as well as many level lines and supports of the cathedral; also the Observatory, erected in 1755, incline towards the south, in the direction of the Anio, the soil there being the weakest.

The campanile not only leans, but has sunk down altogether into the ground. The foundations appear to have cut into a vein of quicksand; and it has sunk so much, that the base could not be seen, were it not for the excavation around it. Standing inside the tower, and before the open doorway, a singular optical delusion is produced: the inclined jambs of the doorway seem perpendicular, while the perpendicular columns and windows of the duomo, seen through, seem inclined.

This has been carefully illustrated by TAYLOR and CRESY (*Arch. of the Middle Ages in Italy*, 4to. Lond. 1829); and very



little information has otherwise been given on the subject of this class of architectural designs, except by HOPE (*Hist. Essay*, 8vo. Lond. 1840), and H. GALLY KNIGHT (*Eccles. Arch. of Italy*, fol. Lond. 1842-44), all of which may be consulted with advantage.

At Mantua, the duomo of S. Pietro retains the fine great campanile, which is in the Lombard style, like that of the cathedral at Susa; this last is one of the finest and loftiest of its kind, and is a good instance of the effect produced by being detached from other buildings.

The tower of the cathedral at Modena, see plate 26, is one, of the four, of which Northern Italy is justly proud. Nothing of the kind is finer than the square, solid, marble pile which forms the lower part; the upper being composed of an octagon of two stories of arched openings, and the whole crowned by a pyramidal cone, which carries on its weathercock the bronze garland, from whence its name of Ghirlandina is derived. This tower is, according to GALLY KNIGHT, three hundred and fifteen feet high. The lower part, on the same authority, is said to have been completed in 1224, and the upper part, by Campione, in 1319; it is now partially defaced by some modern additions.

S. Francesco at Assisi, the most considerable church of the first Gothic period in Italy, has a campanile of Lombard character, a massy pile, with stairs *à cordoni*, commenced in 1228.

In the church of S. Antonio, at Padua, began in 1259, and finished in 1307, by Nicolo da Pisa, the campanili assume a very

remarkable character. Octagonal in form, they are decorated with three stories of semicircular headed openings, and above is an upper story, with pointed arched openings; the whole crowned with a corbelled cornice and spire. These campanili more nearly resemble in form the eastern minaret, than any other work in western Europe. There must evidently have been, in the whole of this design, some strong desire to assimilate the exterior features of this building, to the model of the eastern church, as is most apparent, when the work is viewed from the east end.



Church of S. Nicolo, Pisa.

The campanile of the Benedictine abbey of S. Nicolo, at Pisa, built by the same Architect, in the beginning of the thirteenth century, is very curious and beautiful. The exterior is circular at the bottom story, the next is octagon; the third is an open loggia, surmounted by a hexagonal attic, with a high crocketed roof. It does not carry out the general form of the campanili of Italy, but is interesting, because of its well determined date, and from its being full of the character of the school to which it belongs.

Like so many other of the public buildings in Tuscany, it has been unmercifully hacked and whitewashed, almost to the extinction of its original character. The interior, which presents a winding staircase, supported by marble columns and arches, exhibits a singular degree of skill and contrivance. This structure, which is a very distant adaptation of the notion of the campanile, is a curious proof of the unsettled state of architectural feeling in Italy,—Nicolo not having introduced a single pointed arch. The staircase is important in the history of the art, for, according to Vasari, it afforded the pattern for the staircase of the Belvedere.

The six-storied campanile of the duomo at Prato, also by Nicolo da Pisa, is, in its proportions, almost as fine as that of Florence. It should be studied, since we are now beginning to appreciate these edifices, and to imitate them. It is Lombard, not Gothic; and testifies, as is usual, the entire indifference with which the two styles were contemporaneously employed.

At Florence, too, Sta. Maria Novella boasts of a fine tower

with a pyramidal termination, in the Lombard style, whilst the rest of the church is Gothic, which might lead one to suppose, that after the more modern fashion arose, the older was still continued for this part of the edifice, which, with the chapter-house, was designed by Fra Giacopo da Nipuzzano.

Apparently of the same date as the cathedral, a work of the thirteenth century, is the good square tower of Carrara, having angle turrets, and a pyramidal roof. It has four stories above the roof of the cathedral, with lights in each story, progressing from one light in the lower story to four in the upper; in this arrangement of openings resembling the campanile of Siena.

The campanile of the cathedral at Bari was built in 1267.

The last work of this century, which may be quoted, is that of the cathedral of Cremona, erected in 1284; it is so undoubtedly one of the four finest in Italy, as to be called by common consent "il Torrazzo"; the whole height of this magnificent tower is three hundred and ninety-five feet, two-thirds of which is given to the square part, whose proportion is six times the width of its base in height, being the same as that of the campanile by Giotto, at Florence.

This firm, square, perfect, and still fresh-looking brick tower, is divided into seven stories by string courses, the upper one with battlements and a range of intersecting arches on small columns, carried on corbels; above this rises an octagonal turret, in two stories, the upper one receding within the lower, beautifully surrounded by loggia, and surmounted by a short but graceful cone. It is constructed of two thicknesses of walls, the inner one carrying the octagon turret. The staircase, of four hundred and ninety-eight steps, is carried up between the walls in flights from angle to angle. The whole design is well worthy of careful study, and is as remarkable for lightness and elegance, as for commanding height, and bold and vigorous outline; and since the principal substance used in its construction is brick, it owes nothing of its effect either to beauty of material, or elaborate workmanship. The details are well conceived, and applied with equal judgment and taste. The skilful distribution of the openings, both as to number and width, as the stories rise in succession one above the other, and the admirable proportion of the octagon turret, with its pyramidal termination, to the square tower beneath, merit peculiar attention. It is recorded to have been erected in the short space of two years, on the occasion of the conclusion of a peace, after a long and sanguinary contest between Cremona, Milan, Brescia, and Piacenza, at the joint expense of the Guelphic partisans of the whole of the north of Italy. CIVITELLI, however, is careful to shew, that, in his time it was stated that the square part was as old as the year 754, and that the octagon was the only portion raised by the triumphant party.

The campanile of the duomo at Pistoia was originally (1301) a dungeon tower; and, it would seem, was anciently connected with some of the old municipal buildings, and it was then called the Torre del Podestà; Giovanni da Pisa adapted it to its present purpose, adding three tiers of open arches, and a pyramidal termination, the whole exhibiting much singularity. The lower part of the square tower is cased with marble in alternate courses of red and white. The brick work above is evidently unfinished. In the upper part of the square tower are openings with pointed arches; and the octagonal lantern above has semicircular arched openings on every face. Beside this fine example, there are some others of considerable interest at Verona; and the lofty campanile of the palazzo Doria, near Perugia, once a preceptory of the Templars, forming a fine feature, as seen from the roads to that city, with the belfry at Frascati, are of this date.

The tower of Sta. Chiara, at Naples, partly of the date of 1328, is remarkable, on account of the use the Neapolitan writers have made of it, in their endeavours to assert, to the detriment of the Florentines, a claim, that they were the first to introduce the use of the classic orders. This tower is said to have been commenced from the designs of Tomaso di Stefano, commonly called Masuccio, a Neapolitan, but was really by Giacomo de Sanctis, his pupil. Being decorated with the classic orders, of

very good proportion and detail, the Neapolitan authors have inferred, that it was to this artist, and not to Brunellesco



Sta. Chiara, Naples.

(posterior to him by nearly a century), that was due the revival of classic art. But the error is evident, for the only parts of the building which are due to Massuccio, or his pupil, are the two lower stories; whilst the two upper, decorated with the Doric and Ionic orders, were not added until the beginning of the seventeenth century, according to D'AGINCOURT, who enters very fully upon this subject. It was finished between 1617 and 1624.

The fine Gothic belfry of the Basilica of S. Andrea, is still standing at Mantua, and almost without a rival in its style, except that which is the next subject of notice.

The campanile of Sta. Maria del Fiore, at Florence, in the pointed style, makes the fourth of these noble monuments, especially esteemed in Italy, and is of rich and artistic decoration (see plate 25). It was commenced by Giotto, 8th July 1334, and finished by Taddeo Gaddi. It is forty-seven feet eight inches square on plan, and two hundred and ninety-four feet seven inches high. It rises from a mass of boldly-projecting plinth moldings, admirably designed, and was intended to have been finished with a spire, one hundred and ninety feet six inches in height, but is now terminated by a fine cornice of so satisfactory a character, that it is doubtful whether this variation from the intention of the original Architect is not an improvement on his design. The tower rises in four stories of nearly equal height, the basement and topmost being the loftiest, and diminished from the base to the summit; the windows in the upper story are rather larger than those in the two beneath. It is partly to this disposition of the proportion of the various features of the tower that the elevation owes its beauty; for in a building whose lines are perpendicular, it is, however common the practice may be, a great mistake to diminish the proportions of the stories as they rise; the eye diminishes them fast enough, and the proportion ought to counteract this diminution. The architecture is the true Italian Gothic, uniting simplicity of outline with exuberance of ornament.

It is cased like the cathedral, with marbles of different colours, disposed in various patterns, which supply the place of the elaborate tracery and panelling of the pointed architecture of the North. The four stories of the tower, form finely vaulted chambers within, of great height; but the staircase is easily ascended. On the summit may be seen the four great piers, from which, according to Giotto's design, was to have risen the spire; so that beautiful as is the building, it is still only a fragment. The expense was enormous; it is calculated in the books of the duomo, that the average cost of each square braccio (say two feet square, reckoning the apertures as well), was one thousand florins. The particulars are collected from coeval authorities; yet, however startling in their amount, the design is worthy both of the reputation of Giotto, and of the liberality of the Republic, which commissioned him to erect a monument, which in height and workmanship should equal the most sumptuous and renowned edifices of classic times.

The lofty campanile of the Badia, at Florence, also deserves mention, as forming one of the principal ornaments of the views of that city.

The campanile of S. Gotardo, at Milan, built in 1336, is of brick, except the small stone shafts which decorate it, and is octangular in form. Of the six divisions, or stories, which con-

stitute its height, the two upper are of less diameter than the lower ones, and are surmounted by a cone of molded brick.

The campanile of Sta. Maria de Frari, at Venice, was commenced in 1361, and finished in 1396; and at the same time and city, was built that of the church of Sta. Maria Gloriosa.

At Vicenza, is a lofty and slender campanile, near the Palazzo della Ragione, probably about the same date as the last; its height is three hundred feet, and the width of the base only about twenty feet. The lower part is square; the upper, octagonal, is crowned with a stilted dome of later date, and of the form peculiar to Venice. From the top of the cupoletta to the ground, precisely half the height, is shewn in the accompanying vignette.

This is, however, not one of the campanili strictly so called; it is rather a watch-tower than a belfry; and it would seem to be only accidentally that a bell of any considerable size was hung therein. In this it resembles that at Verona, in the Piazza dei Signori, overlooking the Piazza dell' Erbe, which is still more massy, and of greater height (see plate 26). These, however, belong to the distinct class of military towers.

At the back of the church of S. Giustina, at Padua, is a handsome square campanile, terminated by an octagonal lantern, the whole of very slender proportions. That part of the road from Florence to Milan and Turin, which lies between Sarzana and Genoa, is perhaps the most interesting in all Italy, to the traveller who is curious in these buildings; those of Recco and Rapallo are lofty, and the latter is also especially slender, with many open stories. Cantorio, or Cantù, boasts of a campanile with projecting battlements, also wonderfully slender and tall; having been used as a beacon to correspond with the Baradello.

These productions bring the history of their design down to a comparatively modern epoch, and the several examples in Plates 1, 2, 13, and 14, the liberal contributions of Mr. John Johnson, give numerous illustrations of these buildings of the last three centuries, as varied in design as they are picturesque in form.

Those which more especially deserve mention, are at Viterbo, where Bramante built the tower of the church dedicated to the Madonna alla Quercia; at Forlì, where the campanile to the church of S. Mercuriale, built about 1536 (?) is remarkable for its architecture as well as for its height; and at Bologna, where a fatal example has occurred of the results of a bell falling from its room, crushing a passenger walking through the ground floor.

In 1565, the successor of Giulio Romano, Giambattista Bertano, of Mantua, created superintendent of all the state buildings, by the Duke Gualtiero III Gonzaga, erected the church of Sta. Barbara, with the noble campanile of four orders, considered, at the time, the finest in Italy, on which is an inscription in honour of the Architect.

One of the best of Vanvitelli's productions is the campanile designed by him for the chiesa della Santa Casa at Loreto; this, which is of great height, exhibits a combination of four orders, and is crowned with an octagonal pyramid.

Amongst the campanili of most recent date, there is a remarkably fine one at Naples, having a lofty square tower in the lower portion, and octagonal above, terminated with an octagonal bulb-shaped cupola, covered with the coloured tile peculiar to Naples; altogether it is a very fine work. At Turin are one or two good examples of campanili; and, as above mentioned, there are not wanting pleasing or abundant examples in Genoa and its vicinity.

The lofty tower at Corneto is still surmounted by one of the



Near the Santa Maria della Ragione, Vicenza.



four statues of horses, which were found among the ruins of Tarquinii, and placed on the angles of the tower.

Perhaps there are no finer modern instances to be met with than the beautiful compositions of our countryman, Sir Christopher Wren. His works in London, of the campanili attached respectively to the churches of S. Mary-le-Bow, S. Mary Walbrook, and S. Vedast, Foster Lane, may be cited as examples of the highest merit. These compositions of Wren, will, so long as they endure, give a richness and picturesque aspect to the city of London of the seventeenth century, which the more modern parts of this metropolis still greatly require; and, upon the whole, they are probably the most original works which this country has produced for the last three hundred years.

In tracing the history of this class of building, we find, that the early campanili were simple towers, perforated by semicircular arched openings carried on columns, or piers, not very artistically arranged; arising abruptly from the ground without base or plinth moldings; undiminished to the summit; and divided by numerous string courses into stories of nearly equal height. Their general effect, consequently, is characteristic and picturesque, rather than elegant. One of the best instances, of this class of campanile, is that of Sta. Maria in Cosmedin. (Plate 15.)

When the pointed style from Germany travelled into Lombardy, the great country of brick, small round cylinders were employed to erect the spires; and such we see at Bologna, Cesena, Faenza, Forlì, Milan, Otricoli, Parma, Pavia, Piacenza, even at the gates of Rome in Sta. Maria del Popolo, at Venice, and Verona.

As the art advanced, some very essential improvements were introduced, by giving a slight diminution to the square tower, and surmounting it with the elegant polygonal turret, which we admire in the exquisite compositions of Cremona, Modena, and numerous other towns in Lombardy and the Venetian territory; while the openings were arranged with much skill, so as to give lightness to the summit, the lower part, being left imperforated, imparted solidity to the whole composition; of which we have an example in the tower of Cremona, Plate I, well worthy of attentive study.

The main features of the campanile were still preserved by the Architects of the Revival, who, fully sensible of their extreme beauty and propriety, adopted the general ideas of their predecessors, adapting them with great skill and correctness of taste to the more refined principles of Roman architecture. The lofty square base, pierced with openings above, but solid and massive below, is sometimes as complete in itself as in the earliest cases, at others crowned by the circular and polygonal summit and dome, or occasionally, as at S. Marco at Venice, with a square tower and pyramid. The base is decorated very frequently with rustics and string courses only, or, if the orders be used as pilasters, they are of very slight projection. The Plates 1, 2, 13, and 14, will enable the reader to form a just idea of the merits of these works.

It will be scarcely necessary to point out the beauty, and propriety, of this treatment of the subject, and how superior these simple designs are, to the more elaborate compositions, which, in recent times, have been piled up with a lavish display of columns, pilasters, cornices, and pediments, in the vain attempt to produce, with the details of Roman or Grecian architecture, the outline appropriate to another style. It is also to be observed, that the Italian Architects, of the Revival, adopted the practice, invariably

used by their predecessors, of placing the tower on the ground, and isolating it, as much as possible, from the main body of the church. The advantages of this arrangement are so manifest, that it is difficult to conceive why it has not been more frequently adopted in modern times (unless it be granted that too often the artist has been obliged to obey a reigning fashion), especially when it is observed how much the practice of our illustrious countryman, Sir Christopher Wren, as already noticed, coincided with that of the most approved Architects of Italy.

Before dismissing this subject, it remains only to notice two peculiarities of this interesting class of buildings—one of position, and the other of structure. First, as to position: it will almost invariably be found that they are detached, or nearly so, from the main body of the church; for neither belfries nor baptisteries were considered in earlier times as essential parts of, or embodied with, the church. Thus it is seen in Florence; in Mantua; in the duomo of the island of Murano; in Parma; in Piacenza; in Pisa; at Ravenna, in its various churches; in Susa; in S. Zenone, at Verona; and in S. Andrea, at Verelli; and throughout every place in Italy, where the Lombard style is preserved; and where the baptistery stands near the cathedral, as at Cremona; at Florence; at Pisa; and elsewhere, the steeple makes the third distinct edifice of the sacred group. (Hope, *Essay*, p. 244.)

Its relative position varies in most of the more remarkable instances; and would therefore appear not to have been prescribed by the same rules, which regulated the distribution of the other portions of the group; that at Cremona, being placed on the north side of the western entrance, in a line with the front; that at Florence, in the same position on the south side; and that at Pisa, in an angular direction from the eastern end of the choir. Perhaps, in the majority of instances, it has been placed in the angle formed by the choir and transepts in a cruciform church, or, where there are no transepts, close to the apse at the eastern end.

Secondly, as to construction, it is noticeable, in many examples, that the walls of the base are built in two thicknesses, the staircases being carried up in flights, from angle to angle, between the two walls; or winding round on an inner shaft as a newel: there being no external buttresses, great strength and stability is evidently gained by this arrangement, which, in the instance of the leaning tower of Pisa, has no doubt tended much to preserve it, from the consequences of the very remarkable settlements which have taken place.

Finally, it may be noticed that, however much general resemblance may exist in the campanili of Italy, still there is a marked difference in various localities, partly dependant on the date of their erection, and partly from the different races by whom they were erected. The campanili at Ravenna and Rome have been described. Those of Venice, without distinct string-courses, and distinguished by the vertical panelling, as shewn in the example given at Plate 14, form another class.

The campanili with the pointed arch of Florence, are again distinct in character; and the more modern examples in the neighbourhood of Genoa (Plates 1, 2, 13, and 14), furnish another and an interesting phase.

CAMPANILUZZO, from the same original, is the Italian diminutive of the preceding subject, applied to works of the size of the well-known turrets, placed by Bernini, on the portico of the Pantheon at Rome.

EDWARD T'ANSON, JUN.

CAMPANILE



GENOVA



LAGO DI GARDA



CREMONA

724

1810







MONT-CLAIRE



GENOA



OUBARDY



MONT-SAINT





CAMPANILE



GENOA



GIRGENTI . SICILY .



NEAR GENOA



NEAR NAPLES

John Johnson P.S.A.





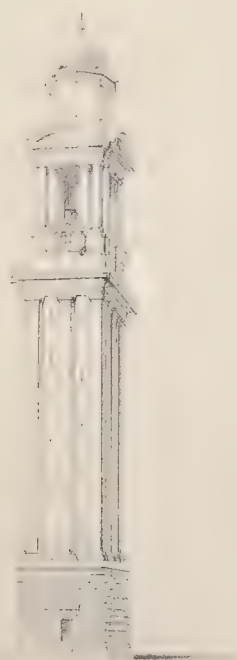
CAMPANILE



GENOA



GENOA



GENOA



GENOA

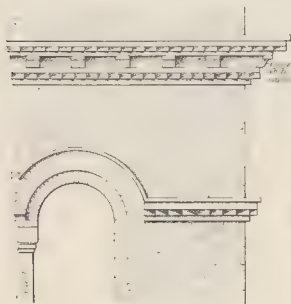
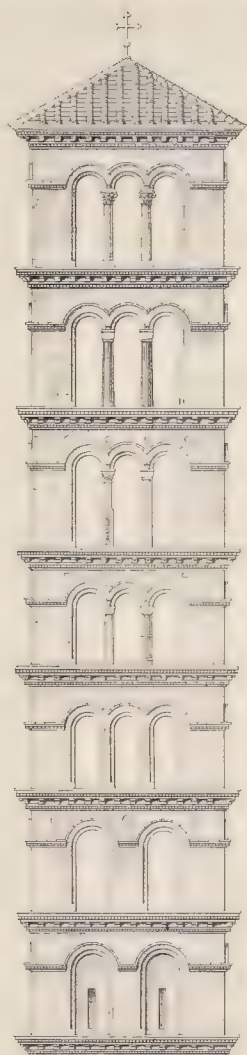
110. John. n. F. 4

designed by Mrs. C. C. May, 1841

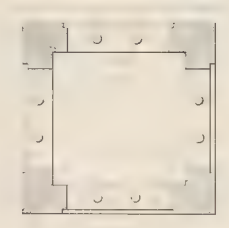




## CAMPANILE

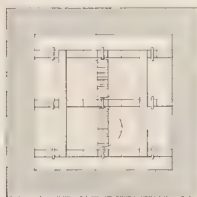


Ved. di sopra, N. E.



Piano della base

La torre è alta metri 40, e ha  
 una base quadrata di metri 4,50  
 di lato. La torre è divisa in  
 sette piani, e ha un campanile  
 di metri 1,50 di diametro.  
 La torre è costruita in  
 pietra e mattoni, e ha  
 una base di pietra.



Piano della base

## S. MARIAE COSMEDIN

BOCCALE LA VENTATA

ROVE

V. L. 1874

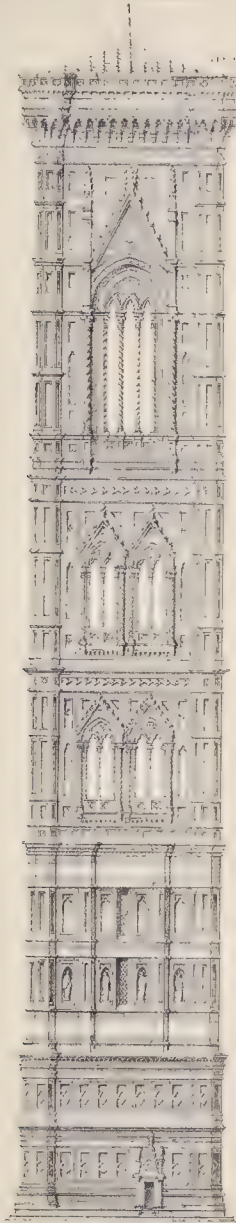
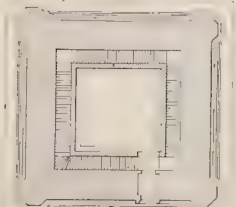
Ved. di sopra, N. E.







## CANTONILE

ELEVATION  
Fig 1

PLAN AT A-A



PLAN AT B-B



PLAN AT C-C



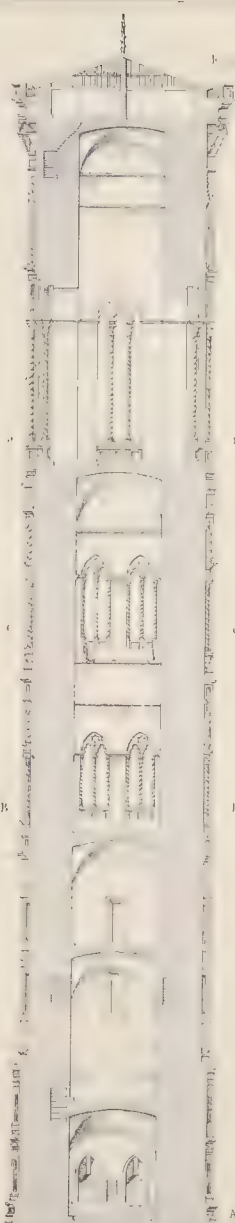
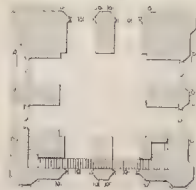
Fig 7

CATHEDRAL OF PINO NOSTRA  
1840-1841

FINCH

ARCHITECTS

1840-1841

SECTION  
Fig 2

PLAN AT B-B





CAMPANILE



Engraved by J. P. G. & Co.  
in copper, by J. G. G. & Co. 1745





## CHINESE ARCHITECTURE.

A TERRITORY of enormous extent, stretching fourteen hundred miles from east to west, and as many from north to south, peopled by above three hundred millions of persons, all living under one sovereign—preserving their customs from a period far beyond the beginning of authentic history elsewhere—civilized when Europe was sunk in barbarism—possessed many centuries before ourselves of the arts which we deem the principal triumphs of civilization, and even yet not equalled by the industry and enterprise of the west in the prodigious extent of their public works—with a huge wall of fifteen hundred miles in length, built two thousand years ago, and a canal of seven hundred, four centuries before any canal had ever been known in Europe,—the institutions of the country established for much above five-and-twenty centuries, and never changing or varying (in principle at least) during that vast period of time—the inhabitants, with all their refinement and early progress in knowledge and the arts, never passing a certain low point; so that they exhibit the only instance in the history of our species of improvement being permanently arrested in its progress,—the sight of such a country and such a nation is mightily calculated to fix the attention of the most careless observer, and to warm the fancy of the most indifferent.—LORD BROUGHAM, *Polit. Phil.*

Although many causes have prevented Europeans from becoming thoroughly acquainted with Chinese art, there are three sources from which the student may gain information sufficient to enable him to form a generally correct idea of it. He has, in the first place, the almost unanimous opinions of travellers; in the second, a knowledge of the uniformity and *esprit de routine* which characterise the works of this people; and in the third, the multiplied images of their houses and edifices, which are supplied by native artists on the various articles of ingenuity and use, which have been imported by commerce for centuries. Mr. Edward Ashworth, architect, of Exeter, having been resident in China for nearly two years, has supplied from his note-book the original and chief portion of this paper, with the accompanying illustrations; his practical experience has also revised the quotations from various authors, whose previous acquirements did not enable them to satisfy professional inquiry. The article on this subject, given by QUATREMERE DE QUINCY, *Dict. Hist. d'Architecture*, has been translated, as his authorities, although early, have been corroborated by travellers of more recent date.

The materials employed by a people in the construction of their edifices determine so naturally the measure or style of their invention and skill in the art of building, that an acquaintance with these materials is essential to the understanding and appreciation of their art.

### TIMBER.

In China, trees are beams, and beams become columns, without the columns ceasing to be, or to appear beams; all the

columns are of wood, and their beauty and value consist only in its quality and polish.—QUATREMERE.

There is in general a great want of timber: the oak being very scarce, the fir tree mostly supplies its place; the san wood, a tree peculiar to China, is inferior to fir. Every mountain's ridge which can possibly produce the fir is planted with it; but with the exception of the hilly districts, there are few forests in the country; for every inch of ground is arable soil. Mantchoo Tartary however abounds in primeval forests, whilst Pechele does not even produce so much timber as to make rafters for houses. In Fokiën the dwellings are of solid granite, and not a piece of wood is seen in the whole construction. There is an utter want of fuel.—GUTZLAFF.

The ly mo, or iron wood, inferior to none for strength and firmness, is used for anchors and various other purposes. Teak is not indigenous. The tse chu, cultivated in Kiangse and Szechuen, resembles the ash, and attains the height of about fifteen feet; this, with the tong chu, produces liquid gums, which are applied to woods as varnish; the former is most esteemed, as it will take any colour; the latter is boiled with litharge to make it fit for use, and seems to be chiefly applied to the floors of the apartments of the emperor and grandees.

Amongst all the plants which China produces, none is so extensively used as the tchou tse, or bamboo, called chok in Canton; every particle of this reed is converted to some use; cottages are built of it, also railings, vessels, boxes, chairs—in fact, all sorts of furniture; and paper is also manufactured from the young stunts.

No idea of these bamboos, or of their use in building, can be gained from the specimens imported into Europe. In China, their shoots attain the height of an ordinary tree; and though this cane is knotty and hollow, it is capable of sustaining great weight, and in some places, even carries good-sized wooden houses.

The nân mo, which supplies a very long, straight trunk, with wood similar to that of the cedar, although the two trees differ widely in their leaves, is used in the temples, palaces, and houses of state, on account of its straightness and durability; it serves for pillars, windows, gates, and beams, being employed in the exterior as well as the interior of buildings, as it is not affected by the action and variations of the atmosphere, or by insects; the natives indeed imagine that it will never decay; and consequently that whatever is formed of it will last for ever. They have, however, no other timber equal in beauty to the tse tan, also called mo wâng, "prince of woods", or rose-wood, appropriated to the finest sort of joiner's and cabinet work; whatever is made of it therefore is held in great esteem.

—GUTZLAFF and DU HALDE.

The columns and rafters used in the construction of houses are rather the bars of a light cage than the support of heavy weights,—the perpendicular beams serve less to support than to unite the cross timbers or horizontal rafters. The framework of the roof is only a light fabric of bamboos placed one



above another, supported by ledges, and diminishing in size as they rise. The ends of these transverse rafters rise either out of the column which they cross, or from the walls themselves, and sustain that part of the roof which overhangs the building.

Columns in China have no capitals: two reasons have prevented the adoption of this universally admitted part of the pillar. The first consists in the absence of both architrave and entablature; the second in the use of double roofs. The first or lower roof being generally only a lean-to or pent-roof, the slope of which necessarily conceals the height of the column; every species of figure, whether for use or ornament, not only appears superfluous, but has not perhaps entered the mind of the architect.—QUATREMERÉ.

#### BRICKWORK.

Bricks are made in great perfection; the Chinese join them together beautifully, so as to form triangles, squares, circles, figures of flowers, etc., which gives to the exterior a very finished appearance.—GUTZLAFF.

Near the city of Nanheungfoo, DR. ABEL observes, that the hills which formed the banks of the river, exhibited a breccial structure at their base, covered with beds of ferruginous clay, which gave to the soil a remarkable redness. Bricks were making of this, which came from the furnace of a blue colour, and such is the hue of all Chinese bricks from Peking to Canton. Dr. Abel disproved, by experiment, the previous notion that the blue brick is only sun-dried, and found that a portion of the red clay actually became of that tint on being subjected to the fire.—DAVIS.

The bricks in size are about ten inches long, four inches wide, and rather more than two inches thick. A one-brick wall will therefore have a hollow of two inches between the stretchers of its two faces. Those of the great wall are reported as being fifteen inches long, half that in width, and nearly four inches thick.—E. A.

The walls of their houses are generally about eighteen inches thick. On the foundations they lay three or four layers of bricks entirely solid. After which they dispose them on the two faces of the wall frontways and lengthways (as headers and stretchers) alternately, so that the front ones meet and occupy the whole breadth; but between those that are disposed lengthways there remains a void space in the middle of the wall. On this first range they lay a second, disposing the bricks lengthways, observing to cover the joints of the front bricks in the first range with a whole brick in the second, and so they proceed alternately from the bottom to the top; and by this means the expense both of labour and materials is considerably diminished, and the weight of the wall much lessened.—CHAMBERS.

#### MARBLE.

Marble is found in the province of Fokiën, and is very common in those of Chantong and Kiangnan, which would equal the best in Europe if it were well polished; but they make little use of it in their public buildings. There is neither palace nor temple, nor any other edifice at Peking or elsewhere, *entirely* of marble. Though pillars are frequently used in their buildings, they have hitherto employed nothing but wood for that purpose. It is uncommon to see anything built even of stone, beside bridges and memorial arches, which adorn the streets of the principal cities in each province; and marble is generally applied for pavements, thresholds of gates, the foundations of some of the pagodas, and the lining of canals.—DR HALDE.

Thus the rarity of stone buildings in China arises certainly neither from lack of material nor saving of expense: the prodigality of some of their emperors makes this last an insufficient reason; and for the first, it cannot be the scarcity of stone, for all the provinces abound in it, and the streets of many of the towns are paved with marble of different colours. The question

arises, could it be the labour of moving it? But here again the gardens of the emperors are filled with enormous masses of rocks which have been transported thither; their palaces rest on huge blocks of alabaster, and large slabs of marble form the steps of the staircases. Neither is it the difficulty of working the stone, since it is employed in many of the public works. It might have been supposed that the fear of earthquakes was the reason for the houses not being built of stone; but it would appear that the climate itself is the great obstacle to the use of this material.

In the southern provinces, the heat, and the damp which accompanies it, would render stone houses unhealthy; and, according to the missionaries, they would be equally so for more than half the year in the northern regions, from the severity of winter, and the baneful humidity of the climate.

Although meteorological causes may have something to do with it, it is more than probable, however, that the force of habit and the system of routine have conspired to perpetuate the use of wood, and thus furnish us with the clue to the difficulty.—QUATREMERÉ.

Between Peking and the great wall, on the way to Jehu, our first embassy observed, for the only time in China, a chalky appearance, and geological features approaching those familiar to us in the south-east of England. In the whole distance between Peking and Canton, no secondary formation so recent as chalk has been met with. Of the mountains bordering on Tartary, those who accompanied Lord Macartney observed that the lowest stratum was of sand and sandstone; the next above was coarse-grained limestone, full of nodules, and of a blue colour; this was covered by an irregular and very thick layer of indurated clay, of a bluish, and sometimes of a brown red colour, communicated by iron, which, in places, was so abundant as to give the clay the appearance of ochre. In some parts were perpendicular veins of quartz, intermixed with granite, at the tops of the mountains.

The islands in the river near Nanking, are an agglomerate composed of round and angular fragments of quartz, limestone, and felspar porphyry, united by a thin argillaceous cement, or buried in sandstone. The mountains on the Poyang lake were found to be of granite, containing milk-white felspar, grey quartz, and greyish-black mica. Occasionally appeared mica slate, with but little quartz.

On ascending the river Kankeang, towards the Meiling ridge, the banks were observed to be composed of the old red sandstone, resting on granite; and on reaching a point called Shepatan, the rocks that obstructed the stream consisted of granite and a dark-coloured compact slate. The rock of the pass through the ridge was distinctly and horizontally stratified; the sandstone was small-grained, its fresh fracture having almost the dark grey colour of clay; but where long exposed to the weather, it was reddish. On descending the other side of the ridge, the road was lined with natural pyramid heaps of limestone, which still preserved the remains of their original horizontal stratification.

The dark grey marble used at Canton is of the coarsest grain, and unsuceptible of a fine polish. In the shops abound large quantities of striated gypsum, or alabaster, which works very easily into small figures. From the neighbourhood of Canton to the sea the rocks are composed of red sandstone resting on granite, until, on reaching the clusters of islands that line the coast, these are found to consist of coarse granite only, crossed by perpendicular veins of quartz. Over the irregular surfaces of the islands, and at the summits of the highest, are strewn immense rounded boulders of the same rock. They are generally embedded in the coarse earth, which is a disintegration of the general substance of the islands, and as this is washed from under them, roll down the steep declivities until they reach a level space, and commonly stud the sandy margins of the islands with a belt of piled rocks, some of them many tons in weight.—DAVIS.

## LEGISLATION.

In STAUNTON's *Tu tsing leu lee* (pp. 463-474) will be found the enactments regarding orders given for public works without sufficient authority, without giving information to a superior, or awaiting a report from an inferior; or for employment given otherwise than in the legal manner and at the legal period, except in case of the fall of public walls, or damage to public granaries, treasuries, offices, or residences; and regarding untrue statements of the labour and quantity of the materials required; and regarding the unnecessary waste of materials and of labour, or their employment in such a manner as to be unserviceable; and regarding the fall of houses and walls, or any other accident by which some person is killed, from mismanagement or want of due diligence and precaution; and regarding the performance, or causing the performance, of any public work contrary to the established rule and custom; and regarding the misapplication of public stores; and regarding due reports of the dilapidations of public buildings; and regarding thefts of materials.

An attempt to destroy the imperial temples, tombs, or palaces, is counted as disloyalty; for as the imperial temples and tombs are intended to perpetuate the memory, and to receive the remains of, former sovereigns, so the imperial palaces, being designed for the use of the reigning monarch, are equally sacred and inviolable. This is the second of the crimes arranged under ten heads, which being distinguished from others by their enormity, are always punished with the utmost rigour of the law.—STAUNTON, pp. 4, 5.

When, in 1799, the Emperor Kia King impeached his predecessor's minister, the thirteenth article of the indictment stated that, "in the late confiscation of the property of Ho-quen, many apartments were found to be built in a most costly manner, of the imperial wood nan mo; and several ornamented terraces and separate enclosures were observed to have been constructed in the style and resemblance of the imperial palace of Ningsheukung; the gardens were likewise laid out in a style little differing from that of Yuenmingyuen and Fungtaoyao-tay; but with what view or design we cannot imagine."—STAUNTON, p. 496.

There is a court (Kung poo) charged with a variety of public works. The office is subdivided into four chambers, which are under the jurisdiction of presidents and vice-presidents.

1. Chamber of architecture (Yin sheu le sze). The officers are, six deputy presidents, six assistants, five directors, six store-keepers, two superintendents of timber, one ditto of the imperial wood for building.

The duties of this board are decidedly architectural. Architecture with them, however, is not the art of invention, but that of imitation. They receive a model, after which they erect a palace; and the more slavish the imitation, the greater the perfection. They have first to build and repair the imperial city and palaces. Each of the cities has four gates. Though these places are not the most splendid princely abodes, they are, perhaps, more capacious than those of other monarchs. Only second to these works are the temples; some of them constituting in themselves large establishments. A few are even splendid, whilst others partake of the grandeur of imperial palaces. The great and principal objects in them are the altars, which must accord in dimensions, as well as in shape, with the objects to which they are dedicated.

For the building of temples and palaces the best materials are brought from the provinces. Peculiar care is bestowed on making the tiles as glittering as possible, in order to increase the outward splendour.

Of secondary importance are the palaces of the higher nobility, who live within the precincts of the imperial city. They constitute part of the imperial court, and are built in conformity to the great pattern. The palace of a prince of the first order has eight gates, and a foundation of three chill in height. It consists of seven great buildings, nine lateral lofts, five large back

buildings, seven sleeping apartments each in a separate edifice, with a number of kitchens, stables, and store-houses. The dwellings of the inferior nobility are smaller, but erected on the same principle. There are a great number of granaries, store-houses, and magazines. The soldiers of the eight standards have about sixteen hundred barracks in the capital, which are built and repaired by the board of public works.

2. Chamber for the manufacture of governmental stores, and the preservation of precious articles (Yu hang le sze).

3. Chamber of hydraulics (Too shwuy tsing le sze) has, amongst other things, the care of the ice-cellars at Peking. This is one of the largest establishments of the court, and there are some cellars which contain about thirty thousand large pieces; yet this does not suffice for the wants of the court.

4. Chamber for the mausolea (Tun teen tsing le sze). The Emperor, not satisfied with stationing a large garrison at the imperial tombs, maintains the members of this department for the express purpose of building and repairing the graves. Meritorious officers are buried at the public charges, and their graves made suitable to their rank: even the nobility are interred by the state. The space allotted to the tomb of a prince of the first rank, is to be one hundred chang in length; a peer of the second, eighty chang; and the lowest nobleman, only thirty chang. Such are the distinctions which this nation draws even after death.—GUTZLAFF.

The name of *policy*, or *regulation*, must be given, rather than that of *theory*, to all the rules of which the Chinese code of architecture is composed. In all its relations to social life, it must pay tribute to the spirit of method and precision which characterises this people. All is reduced to one standard for all sorts of buildings. The column must be uniform in height and size; every pillar which is two feet in diameter, must invariably be fourteen in height. In this way is every measurement throughout the building regulated. These regulations prescribe, in all its details, the manner of construction of the palace of a prince of the first, second, or third rank, and of that of each subordinate functionary. They go even so far as to determine the measurements of public buildings, according to the degree of their importance. The richest man, if without title or office, must be content with a simple family house.

This arbitrary code of laws has produced, as might be expected, great uniformity in the houses of private individuals; and according to this graduated scale, the houses consist generally of the ground floor, as the climate is said to be unsuited to a multiplicity of stories. Indeed the greater number of houses, from the way in which they are built, would not be able to sustain the weight of them. Of what use would another story be to the nobility, whose palaces are composed of five great courts, with buildings around them? Neither have the people any need of them. There is no private house without a court set apart for the retirement and diversions of the women. Besides a small family could not occupy a house of the large extent in which they are erected, with several stories, and they do not choose to divide it with another.—QUATREMERE.

## HOUSES.

Their dwellings vary much less than the extent of the empire would lead us to believe. Much depends on the materials which can be procured on the spot. Millions of people live in small mud hovels, where granite does not abound; whilst in places where this is common, they are almost entirely composed of solid rock. They possess great skill in cutting and joining it, so that the seam is hardly visible.—GUTZLAFF.

The dwellings of the poor are often mere mud huts constructed with sods; in buildings of a rather better class the mud is rammed in a movable mould, to form a consistent wall. In the warmer districts, the poor live in huts of dry kajan leaves bound to a stick frame-work. Where there is plenty of wood, weather-boarded cottages are met with: these are constructed of fir, the



most plentiful timber in that country; and the spars are sawn by a single operator, with an implement resembling our pit-saws.—E. A.

The foundation is not very deep, and commonly consists of granite. It is a very general custom to raise a mud wall and face it with bricks; but houses of that description are soon soaked through and overthrown by gales. Brick houses are covered with thick ridges of tiles, with the convex part downwards, and the chinks by laying others athwart. The spars are round and flat: upon these they either put their bricks or square tiles, well joined with mortar, so as to admit no rain. The Chinese are a peculiar people, even in their mode of building. The hearth is one of the first parts they construct; but they forget to add a chimney.

The interior of the houses of the poor is wretched enough; and such are, by far, the majority. They consist of one room, which serves the purposes of kitchen, sleeping apartment, parlour, and stable, the floor not being paved. In the cold regions, a flue runs along the room, which serves as an oven for cooking the victuals and warming the apartment. The pigs lodge in the snugest corners, and goats, asses, and colts, share the dwellings of their masters. Such are the hovels of the common peasantry. Richer people surround their premises with a stone wall, in the background of which the dwellinghouse and minor buildings are erected. At the entrance, one observes various flower-pots, and often artificial rocks, mountains, and gardens. The principal hall generally faces the south, and is the most ornamental part of the whole house. Along the sides, chairs are placed, and in front stands a table, behind which either the image of an idol, or some inscription, is attached to the wall, with an incense-stand before it. The walls are adorned with inscriptions, either drawn upon a lacquered plank with golden letters, or written upon paper. Behind this public hall are two doors, which lead to the side apartments and the abodes of the females. Most houses are only one story high; if two, the uppermost is inhabited by the women, who live in the most retired part. The windows are very small, and admit, of course, very little light; and glass being scarce, paper and shells are substituted.—GUTZLAF.

In the greatest part of their houses, when you are through the porch, there is a hall (say) toward the south about thirty or thirty-five feet long; behind the hall there are three or five rooms to the east and west, the middle room of which serves for an antechamber. The roof of the house is supported by pillars in the manner following: for instance, if the hall be thirty feet long, it will be at least fifteen feet broad, and then twenty-four pillars support the roof forward and the same number backward, and one at each end. Every pillar is erected on stone bases, and they support the great beams laid lengthwise upon them, and between every two pillars they place a piece of wood or beam across; upon the great beams, and on the two pillars at the ends, they lay other pieces of wood that support the bulk of the roof, after which they begin to build the walls. The pillars are commonly ten feet high. The magnificence of the houses, according to the Chinese taste, consists in the thickness of the beams and pillars, in the excellency of the wood, and in the fine carving on the gates.—DUHALDE.

The interior arrangements of the houses of the upper classes are likewise uniform. According to CHAMBERS (p. 8), they are all narrow and long; the ground floor is divided by a broad passage, which runs the whole length of it. The apartments are ranged on both sides, and consist of a saloon, or large room, for the reception of visitors, a small sleeping room, and sometimes a closet or study. Every apartment has a court and garden before it. The chief room, or saloon, is generally from eighteen to twenty-four feet long by twenty broad, paved with flags of stone, or marble of different colours. The walls are covered with matting to the height of three or four feet, the remainder with different coloured papers. Folding doors divide the saloon from the sleeping rooms. A passage at the side of

this room leads to the study, which is always enclosed by walls and lit with windows. The walls generally are covered with paintings and moral sentences. Besides these apartments, the ground-floor includes the dining-room, the kitchen, the servants' room, the office or counting-house, the bath, etc., and shops facing the street. The leou, or upper story (when built), consists of several large halls that occupy the whole breadth of the house, and cover the apartments on the ground-floor. These are occasionally converted into lodging-rooms for strangers by wooden leaves or slides, which, when chambers are wanted, they fasten to the floor and ceiling, and in a few hours form any number of apartments. Some of these slides are open from the top to within four feet of the flooring; and instead of glass, the open part is filled with very thin oyster shells, sufficiently transparent to admit the light. All the windows in the Chinese buildings are made thereof.

The front of Chinese houses facing the street is either entirely plain, or employed as shops; there is no other opening than the door. The houses of the better classes have in the upper story a gallery or verandah, neatly painted and surrounded with a railing. Terraces are often built above the roofs and surrounded with breastworks. There they ascend to enjoy the cool air of the evening, to dry their clothes, or to keep watch. Such with few exceptions are the buildings over the greater part of the empire. The law does not permit them to deviate from the established rules; and any man, who might venture to erect an elegant and commodious house, would have his property confiscated and pulled down under pretence of useless waste. The streets are narrow, and generally not laid out according to any plan. A few cities however make exceptions. The houses of the villages are so much huddled together that there exists neither street nor lane. In the north, a certain number of houses are built in a square with the doors inward, to screen the dwellings against the blasts of northerly winds.

The houses are crowded with inhabitants, who must be content with a very little space. No class is remarkable for cleanliness, and the houses appear worse than stables if beasts have their abode in them. The inhabitants of the city keep their dwellings in better order; and merchants and shopkeepers excel in tastefully adorning their shops and laying out their wares; but there is nevertheless, with much show, a want of neatness in the interior of the buildings.—GUTZLAF.

The houses of the nobility and rich people, if compared with ours, do not deserve the name to be mentioned. It would be an abuse of the term to give them the name of palaces, they being nothing but a ground-floor raised something higher than common houses; the roof is neat, and the outside has several ornaments. The greater number of courts and apartments fit to lodge their domestics, make amends for their meanness and want of magnificence.

It must be acknowledged, however, that the palaces of the chief mandarins and princes, and such as are rich and powerful, are wonderful for their vast extent. They have four or five courts, with as many rows of apartments in every court. Every front has three gates, that in the middle is the largest, and both sides of it are adorned with lions of marble. Near the great gate is a place encompassed with rails finely lacquered, either red or black. On each side are two small towers, wherein are drums and other instruments of music, on which they play at different hours of the day, etc.

On the inside there immediately appears a large open place, wherein those who wait have petitions, etc., to present; on each side are small houses that serve for the officers of the tribunal to study in. Then there are three other gates that are never opened but when the mandarin ascends the tribunal,—that in the middle is very large, used only by persons of distinction; the rest enter through those on each side. After which, another large court appears, at the end whereof is a great hall, wherein the mandarin distributes justice; then succeed two halls set

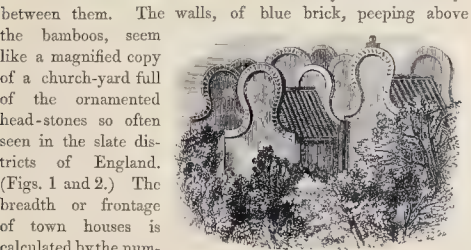
apart to receive visits in, which are neat and abound with chairs and a variety of furniture. Such are generally the places where the tribunals of the great mandarins are erected.

The next court entered has another hall, much handsomer than the former, where none but particular friends are admitted. In the apartments about it, the domestics of the mandarin have their lodging. Beyond this hall is another court in which is a great gate, that shuts up the apartment of the women and children, where no man dares to enter. Everything there is neat and commodious. You may see gardens, woods, lakes, and everything that can charm the sight. Some have gone so far as to make artificial rocks and mountains, full of windings like a labyrinth; and the richer persons have little parks and ponds for fish and water-fowl.—DU HALDE.

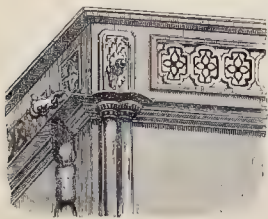
The upper story, generally appropriated to the women, is without a ceiling, therefore open to the spars and battens of the roof, which are occasionally painted; sometimes the former are inlaid with mother of pearl.

The pitch of the roofs is about an angle of twenty degrees; they are covered with two thicknesses of light-red tiles, having the concave side upwards. The joints are protected by small cover tiles, completely cased in a thick roll of lime, stiffened with chopped grass in lieu of hair. A larger roll, curved up to form a sharper point at the apex than the angle of the ridge, covers the gable. From the quantity of cement used about these roofs, they present a most dazzling white to the eye when new. In inferior houses, where the windows are mere jalousies or shutters, oblong panes of thick glass, much resembling the lights in a ship's deck, are inserted in the roof, to be available in stormy weather.

Architectural variety, which is not permitted in China to mar the simplicity of columns, seems to have exercised its sway in forming varieties of gable ends. The character of Chinese villages, as seen from a little distance, is that of houses huddled together, with but very narrow alleys between them. The walls, of blue brick, peeping above the bamboos, seem like a magnified copy of a church-yard full of the ornamented head-stones so often seen in the slate districts of England. (Figs. 1 and 2.) The breadth or frontage of town houses is calculated by the number of rows of tiles (nga harng), instead of lineal feet, each row being about ten inches wide.



Parapets sometimes screen the eaves; these are constructed with piers at intervals, not of necessity standing over the solids between the windows.



ARCH. PUB. SOC.

The piers and the spaces between them are marked out in panels and enriched with stucco-work in a very elaborate manner. Sometimes the parapet is open (Figs. 3 and 11), with dark-green glazed porcelain patterns inserted. These compartments of

open work frequently ventilate the close inner courts, of large dwelling-houses, which are divided by single brick, *i. e.*, ten-inch walls. Sometimes the screen wall is adorned on a larger scale, with mimic bamboo stanchions modelled in lime, as in the two cases shewn in the first view of Plate 1.

Fig. 4 completes the example of columnar decoration of wall surfaces. The coupled pillars are attached at intervals, there being one or two windows between the pairs, and they are based, not in a very solid manner, upon the string of the first floor. One section applies to these bases; the other represents the cornice and parapet, shewn in Fig. 3.



Fig. 4.

The terrace roofs are simply formed by paving tiles about fourteen inches square, laid in hard mortar upon boarding and spars.

Gutters behind parapets are often met with, formed of tile, and discharging at intervals into short stoneware pipes, "funneling" into each other to form a stack (*lao yu*), attached with wire to the brickwork, and stoutly cased with stucco, wrought

to imitate a great bamboo; in the example, Fig. 5, from Canton, it is seven inches in diameter, and often expanding at the top in a tulip-shaped finial as a cistern head.

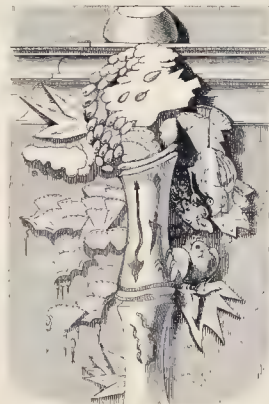


Fig. 5.

Sometimes the parapets are as full of holes as the bridge of a bagatelle board, and no gutter is necessary. Sometimes at the end of a long middle gutter, a gargoyle, that would rival any Somersetshire tower specimen, spouts out the discharge. These uncouth animals are said to gape to a double purpose,—namely, that of swallow-

ing evil influences when they are not disgorging drippings from eaves.

Columns in China by no means lead the fashion in architecture. Though the façades of many places of worship resemble temples "in *antis*", having the outer brick walls forming the sides advanced to the front of the portico (see Plate 3), the two pillars, whether square, moulded, or circular, and often granite, have no capitals, and the shaft runs up behind the carved eaves board, which turns up like a piece of drapery at the ends. This and the "antefixæ" of the rolls of the roof form the whole entablature. There is a good deal of moulding about the bases (Fig. 6), which are often pinched in as barbarously as the ladies' feet.

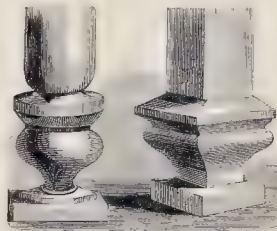


Fig. 6.

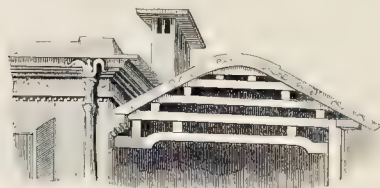
The bases shewn in Fig. 6 are of granite, used for internal pillars of temples at Canton. The shaft is sometimes of pine wood, and rarely more than twelve or fifteen inches in diameter.

The want of a capital is partly compensated for by a bracket, composed of a meander or fret, and which in wood-work



spreads from the column under the rail of the frieze of a verandah, and is generally painted a deep green with red edges, and varnished, and sometimes studded with roses gilt or painted (see Plate 2).

Chimneys in the poorer houses are merely traps of tiling propped a foot or two above the general surface. Superior dwellings have fanciful pots covered on the top, and something resembling those common in Italy.



In Fig. 7 is represented a verandah attached to the flat terrace roof of part of a dwelling-house at Canton. The residence, although built for foreigners (Parses), is of Chinese invention as to its ornaments.

Having commenced (as surveyors do) with the roofs, the carpentry will now be described, and this is decidedly the weak point in Chinese building.

Though frequent brick walls run up in all divisions of the building to take the bearings, it sometimes happens that large areas have to be covered, such as warehouses, where the clear width may be from sixty to eighty feet (Plate 6, Fig. 1). In this case, the trusses are assisted with brick piers, and there is no departure from the uncouth round spar construction. Great labour is directed to getting the ends of the little puncheons or posts accurately scribed to the convexity of the horizontal spar, leaving a little fragile tenon about an inch square as a joggle (Plate 6, Fig. 5).

The carpenters infinitely prefer their own elaborate, though faulty constructions of round poles, to the simple European king and queen post trusses, of sawn timber, which they are able to frame in one-fourth of the time occupied in putting together their own invention.

Floors are formed of the universal sappy pine spars, rarely more than ten inches thick, and if the bearing be fifteen or sixteen feet, the elasticity of the timbers indicates that the amusements of the inhabitants of the one-pair floor do not consist of salutary exercises. As there is often no ceiling to either story, the floor-boards are ploughed and tongued.

Partitions for lathing and plastering are sometimes constructed, but boarded divisions to rooms are more common.

Of out-door works in carpentry, the jetties, bridges, temporary sheds, etc., cannot be called engineering works, as they are executed in a very flimsy manner with bamboos about the thickness of a man's arm, tied together with ligatures of the same material. They are stronger than would be imagined, owing to the number of their fastenings and cross bracings, which, like the innumerable little ties that confined the fabulous Gulliver to the soil of Lilliput, owe their power to their united force. But the writer has seen a bamboo bridge swept entire into the sea by a swollen water-course.

The laws of good construction are not considered to be violated in the imposition of a heavy balcony of brick, plaster mouldings, tiled floor, and earthenware open compartments upon slight bressummers and wood pillars (see Plate 3, Fig. 2).

A portion of a screen, similar to that seen in Plate 2, and represented in Fig. 10, may be described as a series of sash doors, not glazed, the central two being hinged. The more ornamental carvings are gilt, or painted some light colour, whilst the fret and frame-work are green; a white flower is painted on a small horizontal panel above and below the carv-

ing. The dimension, one foot five inches and a half in width, determines the scale.

Doors (moon) are generally simply formed of upright boards keyed at the back. The hinges are often nothing more than pivots above and below, and the lock and bolts of a very wooden construction. They manufacture good brass butt hinges, but the security of doors and shutters is so slight that shops in towns have to their open fronts a head and sill, pierced with mortices to receive the tapered ends of a set of poles about four inches thick, and the same distance apart. This mode of construction is explained in Plate 5, at the right-hand side. When all the poles are *in situ*, a board clamps them at the top, completes the barricade, and behind it the inmates can sleep securely with open doors. Panelled doors are occasionally made by sticking mouldings on the framing, and contriving the bottom rail to be the narrowest.

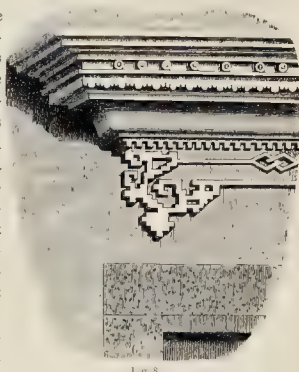


Fig. 9.



Fig. 10.

Windows (chayong moon) are light casements, often hung in rows to form an extent of sash the whole length of the front, and three or four feet in height. This arrangement applies only to the upper story, and the depth from the ranging sill to the floor is fitted with turned balusters about two inches in diameter backed with boarding. In towns, the shop-fronted houses have generally these open façades, sometimes richly carved (Plates 1 and 4).

The casements have their styles pivoted into cleats on the head and sills, having no jambs to hinge to or close against.

The windows often have cornices of plaster externally, the bedmould shorter than the architrave of the head, and finished with a tail of fret-work at each end (Figs. 8 and 9). These illustrations are taken from external examples in stucco, executed at Canton; the fret-work below the bedmould in the larger example, projects about half an inch from the face of the plastering.

There are also triangular and circular pediments to these cornices, very barbarous, and seeming to caricature the style of Inigo Jones and Christopher Wren. The first impression on a new comer is, that the natives got these from the Portuguese; be that as it may (and the question is only to be solved by the study of works erected in the interior of the country), the mouldings and the original enrichments of the tympanum are decidedly Chinese inventions.

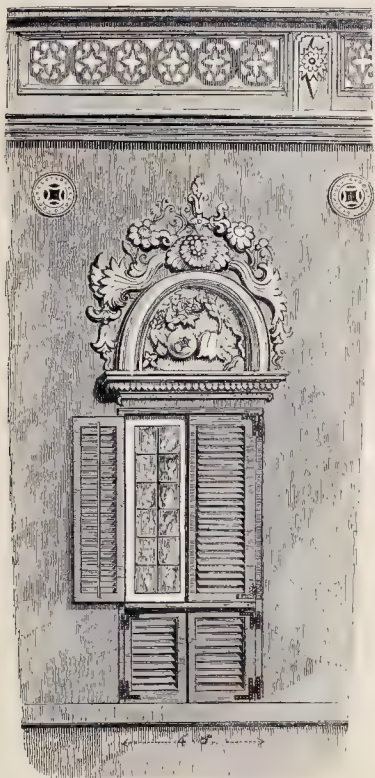


Fig. 11

Fig. 11 is an elevation of a window from Chinam's Hong, shewn in Plate 1. The glazing is perhaps rather too civilized and conformable to English practice to be called Chinese. Fig. 12 is the same cornice and tympanum enlarged.

In well finished fronts the lower part of the sash is a panel with an embossed white sprig of leaves on the ground, which is generally green, as well as the sash-bars, that contain oyster-shell panes of varied angular figures, often disposed at random (Pl. 3, Fig. 1). A central pane larger than the rest will be filled with real glass, composed perhaps of fragments sent in casks as ballast from England, melted down and manufactured in China; while sometimes the sashes are lined with flowered paper.

In less ornamented windows closing into rebated linings in brick walls, the sash-bars which sustain the translucent

shell are longitudinal only, resembling our green-house roof sashes. Basement windows, especially those of warehouses, are strongly barred with iron.

Venetian blinds (*ngao park eep*) sometimes take the place of the oyster-shell transparencies in ordinary houses, and are added as contrevents to those of the rich (Plate 1).

Stairs are often simple step ladders, but are sometimes constructed with rounded treads, risers, and string boards. They have also hand-rails and turned balusters. The principal defect in these conveniences is the excessive height of the riser, nine inches to eleven inches, without a compensating width of tread.

The granite, which so abounds in the neighbourhood of Canton river, is disengaged from the mass by wedges, in blocks, perhaps five feet long and fifteen inches in width and depth. This proportion causes the masonry to exhibit extremely long stretchers and small headers. Three or four courses of ashler generally form the walling of the most assailable part of a large trading house or "*hong*"; viz., from the ground to the sills of the lower windows, which have solid granite jambs, heads, and sills. A plinth with a good ogee moulding is sometimes introduced. The large doorways are most substantially formed of granite. Several sets of jambs and lintels, two feet wide, and nearly a foot thick, that were erecting in a mercantile house at Hong Kong, strongly reminded the writer as he viewed them of a group in Stonehenge. A bead, with an ornamental termination near the ground, adorns the angle of the door-jamb.

The upper part of the building is of blue brick, which the workman does not care to bond well together. The facing is a white stucco; cornices and strings are formed by projecting the edges of tiles one inch and a quarter thick and fifteen inches square, and these tiles too closely dictate through a thin coat of stucco the profiles of the mouldings, though ogees, cavettos, and quarter-rounds, interspersed with little enrichments, are introduced in profusion.

There are plenty of examples of brick arches in the circular apertures which in temples and dwelling-houses form openings for ingress and egress, or for ventilation. Stone mortar (*shia fooi*) is lime mixed with coarse grit. Brick mortar too often with red mud. Though brick facing is frequently executed very neatly, the delight of the Chinese is to plaster over the wall, wash it blue, and draw joints imitative of Flemish bond upon the coloured surface. Often in temples a long panel or frieze is sunk in the brick facing near the eaves, and its white field scattered with flowers and fruits partially gilded.

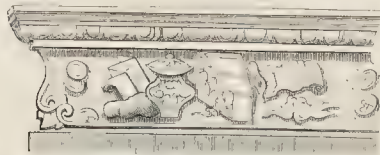


Fig. 13

Like the people whose arts it is our province to describe, we are uniting the trades of bricklayer and plasterer. This two-branch operative possesses the accomplishments of modeller and designer of ornaments and enrichments, which are pro-



duced without working drawings. He creates cornucopie in circular pediments over windows, arranges sprigs of foliage in centre flowers—(Figure 13 is one about three feet in diameter for a room)—lays birds and fishes about rain pipes (see Fig. 5), executes panellings in parapets, and works up cornices



(Fig. 14) with exceeding patience by hand, rejecting straight edges and sheet-iron moulds, and all such line and rule formalities, rather crippling his mouldings however in his independence.

It is chiefly to protect these works on the exterior of a building before the plaster is well set, that an immense cage (tap pong chong) of bamboo is reared, at an expense of two hundred and fifty dollars (£53), to inclose the whole edifice. A good thatching of leaves shelters the stucco-work from the heavy rains, that would destroy in a night the work of several weeks. The setting coat of internal plastering is mixed with shreds of white paper, which supplies the place of hair: the lime sets exceedingly hard.

A remarkable feature in the ornamentation of stuccoed fronts is the introduction of ventilating apertures near the main cornice (see Fig. 11), which communicate with flues that open into the roof when there are plastered ceilings. Other ventilators pierce the slope, that connects the wall and ceiling, an inclined plane conforming to the rake of the roof, and lathed upon fearfully slender battens, which serve for ceiling joists.

Excavation goes on slowly. Earth is removed in two slender shallow baskets, carried milk-pail fashion by the labourer. In the course of the extensive building operations at Hong Kong, consequent on the conclusion of the war, in barracks, military hospitals, and fortifications, the commanding engineer, to expedite the "diggers' work", caused some barrows to be made by the carpenters of the corps of sappers and miners, such as are used by our navvies. As soon as one was brought to the scene of action, the Chinese labourers filled it with earth, and not comprehending the use of the wheel or leverage of the handles, proceeded to lift the loaded barrow upon the shoulders of one or two of the stoutest of their comrades, who were to carry it to the depositing place.—E. A.

The simplicity with which the Chinese make their scaffoldings is quite surprising; the architects of the palace employ neither beams nor planks in their construction; long poles of pine wood, which are neither touched by an axe nor pierced by a nail, and which last for several generations, suffice to make scaffolds of one hundred and one hundred and fifty feet in height; the labourers come and go as in a street, and move about without interrupting each other.—QUATREMERE.

The peculiar fashion of the Chinese tools in most cases proves their originality. Though their iron work is not good, yet their tools, such as chisels, planes, axes, etc., are excellent, and kept very sharp. They make great use of the circular saw, and they possess a saw for particularly fine work, which if we had not seen them using, we should have imagined the work had been done with a chisel. The blade of it consists merely of a single piece of brass wire jagged with a sharp instrument. The pattern to be cut out is traced on the wood, and a hole is bored in it, through which the wire is passed and made fast to the handle, which is kept outside the wood, and is altogether very similar to the instrument used in this country for the same kind of work.—MURRAY.

Their carpenter's saw is formed of a very thin plate of

steel, which for this reason is kept straight by a light frame of bamboo at the back, which serves at the same time as a handle. In appearance, this has a heavy and clumsy look, but the lightness of the bamboo prevents it being so in reality. For all rough work, they make use of a sort of axe slightly rounded on one side. This answers the purpose of an adze. Carpenters work their awls with a thong, the two extremities being attached to the two ends of a stick. The thong being quite slack, a single turn of it is taken round the handle of the awl, which is then worked backwards and forwards with great velocity. The anvil of the Chinese blacksmith, instead of having a flat surface, is slightly convex or rounded. The iron that is worked upon it thus extends more easily under the hammer on all sides, but the metal probably loses something in solidity. The bellows consist of a hollow cylinder, the piston of which is so contrived that the blast shall be continuous.—DAVIS.

Extracts from a list of builders' prices, from an average taken at Victoria, Hong Kong, in 1845. All superficial measurements are computed in squares, ten feet by ten feet; and the dollar has been calculated at 4s. 2d. in reduction to English currency:—

BRICKWORK.	s.	d.
10 inches (thick) per square	39	7
14 inches	60	5
18 inches	79	2
24 inches	98	0
Bricks, per ten thousand	150	0
Flat tiles for paving, per thousand	104	2

PLASTERING.	s.	d.
Two coats rendering and finish stucco, per sq.	4	2
Ceiling, laths and ornaments	14	7
Double tiling roofs	29	2
Partitions, carpentry and lath and plaster	12	6

STONWORK.	s.	d.
Granite, two feet thick, per square	125	0 to 145
Ditto, 1 foot 6 inches thick	108	4 to 125
Granite moulding, 6 inches high, per foot run	1	5½
Granite doorjamb, 2 feet wide, 7 or 8 inches thick, per foot run	8	4

CARPENTERS' AND JOINERS' WORK.	s.	d.
Hardwood, per foot cube	3	1½
Roof spars (pine), three (about 50 feet run) for	4	2
Common wood roofs and tiling, per square	41	8
Flat roof, tiling and timber, per square	104	2
China spars on hardwood girders and flooring, complete, per square	34	1
Window 8 feet by 4 feet, fitted up with French casements and Venetian blinds, in pine	66	8
The same in hardwood	81	8 to 104
Ordinary doors	41	8
Hardwood ditto	50	0

PAINTING.	s.	d.
Best two-coat, per square	4	2
Best three-coat	5	2½
Marble "paving tiles" 14 inches square, per 100	291	8
China (porcelain) balusters, 45 for	208	4
Inch marble floor, per square	250	0

—E. A.

#### GARDENS.

In Chinese landscapes we often see pretty flower gardens, but in execution they are very rarely to be found. Although the gardens are most carefully laid out, there yet appears in them little attention to elegance or pleasure; they are very few; and a Chinese *grande* delights more in artificial landscapes, laid out in a small compass, than in an extensive park or a flower garden. Utility is always studied in preference to pleasure. A few pots constitute generally the whole treasure

of a rich man's house; nor are the flowers themselves so beautiful and odoriferous as those we are accustomed to see in Europe.—GUTZLAFF.

Kienloong, in the province of Keangnan, and Yuenminyuen, near Peking, are the imperial gardens. The grounds of the latter are calculated to comprehend an extent of at least ten English miles in diameter, or about 60,000 acres, a great part of which however is wastes and woodlands. The general appearance of those parts near where we lodged, as to the natural surface of the country, broken into hill and dale, and diversified with wood and lawn, may be compared with Richmond Park, to which, however, they add the very great advantage of abundance of canals, rivers, and large sheets of water, whose banks, though artificial, are neither trimmed, nor sown, nor sloped, like the glacis of a fortification, but have been thrown up with immense labour in an irregular, and as it were, fortuitous manner, so as to represent the free hand of nature. Bold rocky promontories are seen jutting into a lake, and valleys retiring, some choked with wood, others in a state of high cultivation. In particular spots, where pleasure houses or places of rest and retirement were erected, the views appeared to have been studied. The trees were not only placed according to their magnitudes, but the tints of their foliage seemed also to have been considered in the composition of the picture, which some of the landscapes might be called with great propriety. But if an opinion may be formed from those parts of them which I have seen, and I understood there is a great similarity throughout the whole, they fall very short of the fanciful and extravagant description that Sir William Chambers has given of Chinese gardening. Much, however, has been done, and nothing that I saw could be considered as an offence to nature.

## PALACE.

Thirty distinct places of residence for the emperor, with all the necessary appendages of buildings to each, for lodging the several officers of state who are required to be present on court days and particular occasions, for the eunuchs, servants, and artificers, each composing a village of no inconsiderable magnitude, are said to be contained within the enclosure of these gardens. These assemblages of buildings, which they dignify with the name of palaces, are however of such a nature as to be more remarkable for their number than for their splendour or magnificence. A great proportion of the buildings consists of mean cottages. The very dwelling of the emperor, and the grand hall in which he gives audience, when divested of the gilding and the gaudy colours with which they are daubed, are little superior, and much less solid, than the barns of substantial English farmers. Their apartments are as deficient in proportion, as their construction is void of every rule and principle which we are apt to consider as essential to architecture. The principal hall of audience at Yuenminyuen stood upon a platform of granite, raised about four feet above the level of the court. A row of large wooden columns surrounding the building supported the projecting roof, and a second row, within the first and corresponding with it (the interstices between the columns being filled up with brickwork to the height of about four feet) served for the walls of the room. The upper part of these walls was a kind of lattice-work, covered over with large sheets of oiled paper, and was capable of being thrown entirely open on public occasions. The wooden columns had no capitals, and the only architrave was the horizontal beam that supported the rafters of the roof. This, in direct contradiction to the established mode in European architecture, was the uppermost member of what might be called the entablature or frieze, which was a broad screen of wood fastened between the upper part of the columns, painted with the most vivid colours of blue, red, and green, and interlarded with gilding; and the whole had network of wire stretched over it, to prevent its being defiled by birds, etc. The length of this room within was one hundred and ten feet, breadth forty-two, and height

twenty feet. The ceiling was painted with circles, squares, and polygons, whimsically disposed, and loaded with a great variety of colours. The floor was paved with grey marble flag stones laid chequerwise. The throne, placed in a recess, was supported by rows of pillars, painted red like those without. It consisted entirely of wood, not unlike mahogany, the carving of which was exquisitely fine. There was very little furniture in it. In the different courts were several miserable attempts at sculpture, and some bronze figures, but all the objects were fanciful, distorted, and entirely out of nature. The only specimen of workmanship about the palace that would bear a close examination, besides the carving of the throne, was a brick wall enclosing the flower garden, which perhaps, in no respect, is exceeded by anything of the sort in England.—BARROW.

The missionaries say that the Louvre would be lost in one only of the numerous courts of this palace. This is explained by what has been already stated. If the Louvre were reduced to a ground-floor, its two other stories would suffice to make two palaces equally great. It is then in the grandeur and size of the plan that this palace surpasses European edifices. On all hands we are given to understand, that though the detached portions do not strike the eye as the choice morsels of finished European architecture, nothing elsewhere can be compared to the effect of the *tout ensemble*.

This vast extent of ground plan, either covered or enclosed by towers, galleries, porticos, and saloons, has the more striking effect from the variety of their forms, simplicity of their proportions, correspondence of their plan, and remarkable measure of unity and harmony in the several masses. It is striking to observe the gradual increase of embellishment on approaching the throne and emperor's apartments. The side courts are not to be compared to those in the centre, nor do the first entered approach in magnificence to that of the inner courts. The same graduated scale is observed in all the articles of furniture and luxury throughout.—QUATREMER.

The emperor's palace at Peking, is a prodigious heap of great buildings, of vast courts and gardens. It is enclosed by a wall of brick, about twelve Chinese lys round—this wall has battlements, and is adorned with little pavilions at the angles,—over each gate there is a lofty pavilion, stronger built, and surrounded by a gallery, which is supported by pillars, and resembles a peristyle. This is properly called the palace, because this compass includes the apartments of the emperor and his family.

The space which is between the first wall, Hoang tching, and the inclosure of the palace, is above fifteen lys in circumference, and is taken up by houses which belong to particular officers of the emperor's household, or to the eunuchs, or to the various tribunals.

Although the architecture of the imperial palace is entirely different from the European, yet it strikes the eye by the grandeur and regular disposition of the apartments, and by the structure of the roofs, which have four sides, and rise very high. The whole is covered with varnished tiles of such a beautiful yellow, that at a distance they appear almost as bright as if they were gilt. Another roof, as bright as the former, springs from the walls, and ranges all round the buildings, and this is supported by a forest of beams, joists, and spars, all lacquered with gold flowers on a green ground. This second roof, with the projection of the first, make a sort of crown to these structures, which has a very fine effect. Whatever difference there may be in the goût of architecture, it is certain that these apartments, with their courts surrounded by galleries, and ranged one after the other in regular order, form an entire structure, which is extremely grand, and worthy the greatest empire of the world.

The terraces, upon which the apartments are built, contribute very much to give them that air of grandeur. They are about fifteen feet high, cased with white marble, adorned with balustrades of pretty good workmanship, and open only at the steps placed on each side, and in the middle and corners of the



front. The ascent in the middle is only a slope of marble, consisting of one or two blocks, having neither steps nor landing place. Those terraces before the windows of the apartments make a broad platform, paved with marble, which, in their length, from east to west, always projects seven or eight feet beyond the building.

The hall of the mandarins, *Tai ho tien*, is about one hundred and thirty feet long, and almost square; the ceiling is carved work, lacquered green, and covered with gilded dragons; the pillars, which support the roof, are about six or seven feet in circumference at the bottom, encrusted with a kind of paste, and lacquered red; the pavement is partly covered with an ordinary sort of carpet, imitating those of Turkey; the walls are destitute of all ornament, very well whitened, but without tapestry, glasses, paintings, &c. The throne, which is in the midst of the hall, consists of a lofty alcove, very neat, but not magnificent. A platform extends in front, and beyond the hall northwards, having two lesser halls attached.

The court before the imperial hall is the largest in the palace, being at least three hundred feet long, by two hundred and fifty wide. Upon the gallery which surrounds it are the Emperor's magazine of all valuable goods. This gallery has five doors; one to the east, another to the west, and three to the south front. There is nothing extraordinary in this front. It has a large court before it, the descent to which is by a staircase of marble, adorned with two great lions of copper, and a balustrade of white marble; the steps are made in the shape of a horse-shoe, on the bank of a little serpentine river that runs through the palace, over which there are bridges of the same material. It would be endless to describe all the edifices of this palace; these are the most magnificent in the opinion of the Chinese and the Tartars, and are sufficient to give an idea of this work.

The palaces of the Emperor's children and other princes of the blood are very neat within, extremely capacious, and built at a great expense: the same design runs through the range of the buildings, and in the ornaments, namely, a row of courts adorned with buildings on the sides, and in front a hall lacquered and raised on a platform three or four feet high, bordered with great blocks of hewn stones, and paved with large square tiles. The doors, which generally open into some bye streets, have no other ornament than two lions of brass or white stone, of but indifferent workmanship, without any order of architecture, or any sculpture in stone, such as there generally is in the triumphal (or monumental) arches.

Of the palace of Nanking there are not the slightest remains; it having been destroyed by the Tartars in their first invasion, along with some temples, sepulchres of the Emperors, and other stately monuments.—*Du HALDE*.

#### BUILDINGS.

A *Tsoo tang*, or hall of ancestors, exists in every considerable neighbourhood. In lieu of idols, the niches are filled with tablets to the honour of those worthies of the district, who in their life-time distinguished themselves by talent or virtue. These halls are often contained in the *Wun miaou*, temples of letters, dedicated to Confucius, which are as frequent as libraries ought to be in a country that has deified him, and where the catalogue of the imperial collection of books is actually printed and sold for a trifle, for the benefit of the literati, who form the first of the four castes of the people.

There is generally a tradesmen's hall in every principal city, belonging to each wealthy corporation of traders, if it may be so termed.

The embassy of 1816 observed at Kanchowfoo, a principal city of Keangsy province, that by far the most considerable buildings were the commercial halls belonging to the associated merchants and dealers. The principal room in the exchange of the green-tea merchants, who pass by this town on their way to Canton, was named *Hychun tang* (Hyson Hall). In the appro-

priation of these edifices there is a singular combination of religious with commercial objects. They generally contain a temple of Budh or some local divinity, and at the same time are used as an exchange, or house of entertainment and lodging for the society of merchants to which they belong.

Other towns may be presumed to contain, as Canton does, a foundling hospital; a *Yang tse yuen* or retreat for the poor, aged, infirm, and blind people who have no friends to support them; and a *Ma foong yuen*, or hospital for lepers.

Canton, and indeed every other principal city, also contains a building in honour of the majesty and long life of the Emperor, under the title of *Wan show koong*, or hall of ten thousand years: the walls and furniture of this edifice are yellow, and at the period when the Emperor's birthday occurs in every year, the viceroy and all the principal officers of government, both civil and military, assemble there to pay him adoration. The solemnities practised are exactly the same as when he is present.

Official persons are accommodated with lodging on their journeys, in buildings called *Koon kuân*, or government hotels; and where these do not exist, the priests of the Budh sect are called upon to provide for them in their temples.—*DAVIS*.

#### TEMPLES.

There is a great difficulty in deciding upon the general form of Chinese temples, as writers have not been careful to define whether they describe an edifice of the Confucianists, Budhists, Rationalists, or even Mahometans.—*E. A.*

The most considerable Budhist temple in Canton is described by *CHAMBERS* as occupying a large extent of ground, and containing, beside sanctuaries for the idols, apartments and other conveniences for two hundred 'bonzes', with hospitals for a great many animals, a large kitchen garden, and a burying ground, where priests and animals are promiscuously interred, both being equally honoured with monuments and inscriptions. The first object, which presents itself, is an extensive court, with a triple avenue of trees, which leads to an open (in original or covered, as given by *QUATREMERE*) vestibule, to which you ascend by a flight of steps, whence we pass on to a second, in which are four colossal figures of stucco, seated, and holding various emblems in their hands. This vestibule opens into another large court, surrounded by a colonnade and cells for the bonzes. Four pavilions are placed in it on basements. These are the temples, and consist of two stories, both filled with idols. At the four corners of the court are four other pavilions for the superior bonzes; and under the colonnades, among the cells, are four halls where idols are placed.

To the right and left of this court are two small ones, surrounded with buildings; the one contains the kitchen and the refectories, and the other the hospitals. The cells of the bonzes are of brickwork, very small, and without any other light but what comes in at the door. The principal part of the buildings are of the same material, but the columns are of wood, with marble bases. The buildings are all covered with tiles, painted green, and glazed.

The same arrangement is observed in all buildings of this kind; the only great variety consisting in the size and number of the courts.

As to the elevation of these pavilions or *Tings*, there is very little variety; they are generally composed of two stories. Thus, in the pagoda of *Ho nang* the columns of the first story are eight diameters high; their bases are one diameter. All these columns, excepting those at the angles, have, at the top of the shaft, eight consoles, or brackets, forming a very clumsy kind of capital. This ornament, though very frequent in Chinese architecture, is by no means pleasing to the eye. The diameter of the second order of columns is about four-fifths of that of the first; their height is six diameters and a half, and they are without bases. Under the second roof runs an open fret, composed of circles and squares alternately disposed. The angles of both roofs are enriched with ornaments of foliage and

grotesque figures, and on the top of the second roof are two dolphins, one at each end, with a flower in the centre, resembling a tulip.

## TOWERS.

The buildings, which we call towers, have in China different names, expressing the nature of their destination.

Beside those employed in fortification, the most celebrated are the *ta*, or *paou-ta*, which the Europeans have made pagoda, attached to the Buddhist temples.

At Peking one serves for an observatory; another is the choong low, or bell tower, containing a cylindrical bell of prodigious size, for announcing the five watches of the night to the inhabitants; and a pagoda was erected by the Chinese to commemorate their frustration, in 1808, of Admiral Drury's intention to reach Canton.—E. A.

In 1821, a notice was placarded at Macao, stating, that "the Chinese and foreign merchants have hitherto been prosperous, their wealth abundant, and the destinies of the place altogether felicitous. Of late, however, its fortunes have waxed lean, and the influence of the atmosphere been unlucky, so that the acquisition of riches has become less certain. A proposal is accordingly made to erect a pagoda and a pavilion, in order to renovate and improve the commercial fortunes of the island. The plan has fortunately met with the concurrence of the Portuguese magistrate, who has offered one hundred dollars to assist in its execution. Leang-ta-tsun, whose skill is universally acknowledged, and everywhere attended by incontestable proofs, has visited Macao, in order to fix on a proper spot. He declares that a lofty pavilion should be erected on the seaside, near the new village to the right of the temple of Ma-tsoo, and a high pagoda on the eastern arm of Monkey Island. He affirms that both prosperity and riches will be the result; that both Chinese and strangers at Macao will share in the felicity. He has written a paper on the subject, and drawn out the plan, which has obtained the consent of the Portuguese magistrate; the permission of the Chinese functionary has also been graciously given. It is therefore resolved," &c.

Lord Amherst's embassy also remarked, at Nanganfoo, a small tower erected merely for the sake of good luck.—DAVIS.

It seems the *ta* of China is not intended for sacred purposes, but erected occasionally by viceroys or rich mandarins, either for the gratification of personal vanity, or with the idea of transmitting a name to posterity, or perhaps by the magistracy merely as objects to enrich the landscape.

They are generally built of brick, and sometimes cased with porcelain, and chiefly consist of nine, though some have only seven or five stories, each having a gallery, perhaps of marble, ornamented with gilt iron rails, which may be entered from the windows, and a projecting roof, covered with tiles of a rich yellow colour, highly glazed, which receive from the sun a splendour equal to burnished gold; on each angle of the roofs a light bell is suspended, which is rung by the force of the wind, and produces a jingling not altogether unpleasant.—ALEXANDER.

The lowest story contains an octagonal chamber, in the middle of which is the staircase; the others are similar. There is no difference in the cornices of the several stories, they are composed of a fillet and a large cavetto, enriched with ornaments representing the scales of fish. The roofs are all turned up at the angles, and all but the lowermost are adorned with little bells and foliages. The building is finished with a pole, surmounted by a ball, and around it are nine iron hoops or rings, suspended by chains, fixed to the angles of the uppermost roof.—CHAMBERS.

These buildings are, for the most part, octangular, though some few are hexagonal and round. In height they are generally from an hundred to one hundred and fifty feet, and are situated indiscriminately on eminences or plains, or oftener in cities. Those of more ancient date are in a mutilated state, and the roofs covered with grey tiles, overgrown

with moss, while others have a cornice only instead of the projecting roof.—ALEXANDER.

Of these striking monuments of Chinese architecture, "pagodas", the one best known to Europeans stands on an island in Canton river, near Whampoa, the place where merchant ships take in their cargoes, a few miles below the city. Pachow techoo, the pagoda of Pachow, is nine stories in height; the tapering octagon, has a white facing, with red quoins and eaves course; the roof tiles were, doubtless, originally green and red or yellow. Another, called the halfway pagoda, stands between Whampoa and Canton. Of these edifices it is recorded "that the pagoda on Pachow, and the adjacent temple, dedicated to the monsters of the sea, were built in the twenty-fifth year of Wanleih (1598); and that the pagoda at Cheihkang, and the temple then consecrated to the god of letters, were founded in the reign of Teenke (about 1621); all these structures have had a most happy influence on everything around them, causing the number of literati to be very numerous, and the productions of the soil most abundant. Recently, however, the winds and rains, driving furiously, have broken down the tops of the pagodas, and laid the temples in ruins, and injured even their foundations. Their appearance now is very unsightly; they ought to be repaired, in order to secure the return of happy and prosperous times. The pagoda on the north of the city, which rises five stories high, and has its walls painted red, a colour which from its very nature is productive of fire, ought also to be repaired, and painted with some other colour. Already we have obtained the permission of their excellencies the governor in council, to proceed with the contemplated repairs, and also recommendatory papers, in which they advise the people to assist in accomplishing this work. It being an affair which greatly concerns both our honour and prosperity, we have a right to expect, fellow-countrymen, that you will heartily cooperate, joyfully and promptly contributing, little or much according to your ability, so that by our united efforts the repairs may be soon undertaken, and the buildings rise again to their former splendour. Then, according to your deeds of merit, the gods will send prosperity, and your glory and virtue will become great beyond comprehension."—*Extract from a subscription paper, originating amongst the gentry of Canton in 1837.*

One of these towers at Keangyin, seen by the British invading forces, is described as built of red brick, each story overhanging the one below it, and thus preserving the perpendicular internally, whilst its external form is tapering. This edifice had an unfinished appearance *though* in ruins.

Perhaps a ruin near Hangchowfoo, called the tower of the thundering winds, may boast of the highest antiquity. It is supposed to have been erected 2500 years ago.

The chroniclers of the war of 1841 record the finding, at Chinkeang, of a small iron pagoda, about thirty feet in height, having each of its seven stories in a separate casting. It was ornamented on all sides with reliefs and characters a good deal defaced, and from these Mr. Gutzlaff gathers that the building must be at least 1200 years old.

These tapering towers, that so truly characterize the architecture of China, are not nearly so often met with there in reality, as in the representations upon plates and teacups in daily use in England.

A consideration of the danger and difficulty, if not impossibility, of prosecuting anything like architectural research amongst a semi-barbarous and prejudiced people, persuades us to rest contented with reprinted accounts by travellers comparatively old, and too often ill informed, or even the bare mention of the three thousand pagodas surrounding the sacred lake of Oitz, in the unsubdued isles of Japan; and of the great wall, projected by Ta che hwang, about two hundred and twenty years before the Christian era, to defend his country against Tartar inroads. The lower part of the facing of this wall is of stone, the upper of brick. The thick-



ness at the base is twenty-five feet, the core being of earth, and diminishing to fifteen feet at the top. The towers, which strengthen the wall at intervals, are forty feet square at the base, tapering to thirty feet at the summit. The parapets are furnished with embrasures, but are not thick enough to resist cannon balls.—E. A.

## CITIES.

I have taken notice in another place that there is scarcely any difference between the greatest part of the cities of China, and that they are all nearly alike, so that seeing one is sufficient to give an idea of all the rest. They are for the most part square, when the situation admits of it, and surrounded with high walls, with towers built against them at proper distances. They have sometime ditches, either dry or full of water. The gates of the cities, though they are not adorned with figures in bas-reliefs like other public works, surprise very much by the prodigious height of the two pavilions that form them, by their vaults or arches that in some places are of marble, by their thickness, and by the strength of the work. Triumphant arches in the streets, tolerably handsome temples consecrated to idols, or monuments erected to the memory of the heroes of this nation, and of those who have done some important service to the state, and for the public good; in short, many public structures are more remarkable for their vast extent than for their magnificence. Add to this, some pretty large squares, long streets, some very wide, others but narrow; the houses on each side having only a ground floor, or one story higher. There are shops adorned with Chinese ware, silks, and japanned goods. Before the door of every shop there is placed a pedestal, upon this is fixed a board seven or eight feet high, either painted or gilt, on which board are written three large characters, which the tradesman chooses for the sign of his shop. There are sometimes inscribed on it two or three sorts of goods which are sold in the shop, and at the bottom the trader's name, with these words, *pou hou*, that is to say, that he will not cheat you. This double row of a kind of pilasters, placed at an equal distance, make a colonnade, the perspective of which is pretty enough. This, then, is in what the beauty of the Chinese cities chiefly consists.—DU HALDE.

Some of the imperial palaces are laid out very tastefully, and the temples, too, often look very romantic; but to search for grandeur and classical perfection is quite out of the question. We may discover a gorgeous display of stateliness, and a pile of building chosen on a very romantic spot, an open, pleasing view, a row of low buildings following in close succession, with their dragons, painted roofs, and gilded cornices; but then we have seen all. Add to this the constant uniformity, the absence of tasteful columns and cornices, and everything else in which, according to our ideas, the excellencies of architecture consist, and we shall be able to form a just idea of the perfection of this art in China. There is not even a word in the language to express it. Nevertheless, the Chinese at Macao have built tasteful houses, and would, doubtless, be able to rear palaces, if any one would furnish them with a model, and procure for them the liberty of executing the work.—GUTZLAFF.

## CANALS.

The most excellent of all their works relate to the rivers and canals, which are managed with the greatest advantage to the public, insomuch that one may pass from Canton, the most southern city, to Peking, the most northern, without travelling more than one day by land, and not even that, by going a little about by the province of Quang-si and Hou-quang.

Great numbers of these works are to be seen; they are often lined on each side to the height of ten or twelve feet with fine squared free stone, and in some places with grey marble. Some of them have banks that are twenty to twenty-five feet

high on each side. The great canals that are in every province discharge their waters to the right and to the left into several small ones, that afterwards form a great number of rivulets, which are dispersed in the plains, and reach to the ends of the towns, and often to the great cities.—DU HALDE.

## BRIDGES.

From space to space these canals are covered with a great number of bridges, of three, five, or seven arches—that in the middle is sometimes thirty-six and even forty-five feet wide, and is very high, that barks may pass through without taking down their masts—those on each side are seldom less than thirty feet, and the rest diminish in proportion towards each end of the bridge.

It was only in Keangnan that solid bridges were observed to be thrown over the canal, being constructed of coarse grey marble or a reddish granite. Some of the arches were semi-circular, others the transverse section of an ellipse, and others again approached the shape of a horse shoe, or Greek omega.

Another mode of construction is by caissons of wattles filled with stones, and fixed with large perpendicular spars; over the whole were laid planks, hurdles, and gravel.—DAVIS.

The construction of a singular bridge is described by BARROW, page 338.

There are some of these works, that instead of arches or vaults, have three or four great stones placed on piers, in the form of planks, ten, twelve, fifteen, and eighteen feet in length, and the piers are often so narrow that the stones seem to be suspended in the air.

After having finished the arches that are next the land, when the bridge is to have only one principal arch, or raised the causeway of piers when it is to have several, they then make choice of stones of four or five feet long, and half a foot broad, which they place alternately upright and crosswise, in such a manner as to contrive that the keystone shall be laid horizontally. The top of the arch is commonly no more than the thickness of one of these stones, and because the bridges, especially when they have but one arch, are sometimes forty or fifty feet wide between the piers, and consequently, are raised very high and much above the causeway, they ascend on each side by steps of easy ascent, viz., about three inches each. There are some, that it would be difficult for horses to pass over, but the Chinese employ only porters to carry their bales, and the whole work is generally very well contrived.

Some of the fine bridges are highly ornamented. That near Peking had small pillars placed on each side, separated by cartouches of fine marble, carved with flowers, foliage, birds, etc. At the entrance to the bridge were two marble pedestals placed on each side, on which were two lions of great size with various small ones playing around them. At the other end were two marble pedestals, on which stood the figures of two children carved with some ingenuity.—DU HALDE.

The Chinese have different sorts of bridges, each one having its different mode of construction, there are bridges for use, bridges for magnificence, etc.; there are, accordingly, many names employed to designate the varieties, such as lever, compass, balance, swing, bridges, etc. There are also bridges composed of pillars, placed at intervals, connected by chains of iron. The Chinese have, however, long understood the art of constructing vaults. If, in the erection of some of their bridges, they have not availed themselves of arches, others prove that it is not from ignorance. Their paintings and paper hangings, and their drawings on different pieces of furniture, are full of stone arches.—QUATREMERE.

## FURNITURE.

The apartments of the Chinese are by no means so full of furniture as in England, and in this respect they have reached a point of luxury far short of our own. Perhaps, however, they are the only people of Asia who use chairs.

Some of the articles made for the English at Canton, could not often, in point of neatness, be surpassed in this country, and in respect to solidity are sometimes superior.

In the forms of their furniture they often affect a departure from straight and uniform lines, and adopt what might be called a regular confusion, as in the division and shelves of a book-case, or the compartments of a screen. Even in their doorways, instead of a right-angled aperture, there is often seen a complete circle, or the shape of a leaf, or of a jar. This, however, is only when there are no doors required to be shut, their absence being often supplied by hanging screens of silk and cloth, or bamboo blinds. Two or three boards, secured on forms, and a few bamboo sticks for stretching the mosquito curtains, form with a mat the ordinary bed of the Chinese.—DAVIS.

In adorning their rooms they are equally economical; a few pictures hung around, occasionally a mirror, and a few grotesque drawings upon a white wall, are the most common ornaments. Lackered and polished wooden chairs, some tables, a couch, some painted or lackered screens, constitute the furniture. Mud houses are beautifully pasted with paper. The floors, which generally are paved with bricks, are covered with excellent mats, or in winter with carpets or felt.—GUTZLAFF.

In Chinese apartments there is placed a broad couch, in size approaching to that of a bed, called a kang; on the middle of this is planted a little table about a foot in height, intended to rest the arm or place tea cups upon; on either side of this little table, on the couch, sit the two principal persons, fronting the entrance; and from the ends of the couch, at right angles to it, descend two rows of arm-chairs for the other guests, who sit nearest the couch according to their rank. Their arm-chairs are always ranged in regular order, and being very bulky and solid, like our old-fashioned seats of former times, they are not easily removed.—DAVIS.

## TOMBS.

Of monumental architecture there is nothing to remark, unless mention be made of an avenue of gigantic figures leading to the tombs of the kings at Nanking. The warriors cased in armour, are in two rows on each side of the road, across which large tablets of stone are extended at intervals. The ordinary burial-places are waste barren lands on the side of a hill, on which a place of sepulture is marked by a horse shoe form, three or four yards in length, being excavated, lined with walling and paved. At the deeper end is a headstone of granite with the deceased's name.—E. A.

The indigent are compelled to be content with covering the coffin with earth, which is made into a pyramidal form, between five and six feet in height, on which they plant flowers, and a species of white feathery grass.

The tombs of the mandarins and wealthy are frequently splendid, much elaborate carving being bestowed upon them; the coffin is first put into a vault, over which earth is piled to the height of twelve or fourteen feet, and nine or ten in diameter, this mass is shaped into a regular hat-like form and is plastered over with a mixture, which renders the earth impervious to rain. Around this are planted trees in pairs: first two cypress trees, then two pine trees, then two cypress trees, continuing the same round the tomb. Near the sepulchre is placed a long table or stand, made of stone or marble, and on this are placed candlesticks and jars to burn the joss sticks or incense in; on either side of the table are placed figures in pairs of men and animals, whose attitudes and expressions of their countenances betoken grief.

The finest tomb of this description is situated near Sungkiangfoo, and was erected to the memory of a mandarin of high rank; the site selected is peculiarly picturesque, the tomb being placed half way up a well wooded hill, to which access was obtained by a wide flight of stone steps. On either side of the steps were placed stone figures, most beautifully sculptured; these represented two bonzes of gigantic stature, two horses

completely comparisoned for riding, two sheep, two dogs, and two cats: the effect of this extraordinary memento, placed in this picturesque spot, produces a most overpowering sensation of awe upon the mind of the beholder. Near Ningpo, a similar tomb is to be seen, but the figures are materially smaller and not so well executed, neither are the natural beauties of the surrounding scenery to be compared to the sublime prospect of the hill at Sungkiangfoo.—SIRR.

The body of a rich person is generally transported to his native province, however distant; but on the journey it is not permitted to pass through any walled town. We might take a lesson from their wholesome practice of allowing no interments within cities, and of confining them either to hills or the most barren tracts unavailable for cultivation, thus consulting at once the health and the subsistence of the living. To perform the rites at the hills, is synonymous with the *tombs*, in Chinese.—DAVIS.

## PAI LOU, OR PAE FANG.

The taste for these erections, which are a species of monumental memorials, is universal in China. In the smaller towns they are built of wood; some are very large, and deserve attention; the most surprising thing about them, however, is their immense number. The Chinese annals make mention of three thousand six hundred and thirty-six erected in honour of as many individuals; captains, mandarins, princes, philosophers, all, indeed, who have rendered any service to the state, claiming a right to them.—QUATREMERIE.

The women have their share of this honour, and they have distinguished several who have deserved and obtained the like titles of honour, and whose heroic virtues are constantly celebrated in the works of their most famous poets.

The monuments at Ningpo have generally three openings; a large one in the centre, and two small ones at the sides; hexagonal columns, or stone pillars form the jambs; the entablature is composed of three or four faces, generally without projection and moulding, except the last, or the last but one, which is in place of a frieze, of a great height, and on which some inscription is engraved. Instead of a cornice, there is a roof as a finish, which rests upon the side posts of the arches. Every gate is made in the same manner, only every part proportionally less. All these pieces, though of stone, are joined together by tenons and mortices, as if it were of wood. The later erections fall infinitely short of the old ones, demonstrating the superior skill of the ancient builders.

Upon these memorials, which are seldom above twenty or twenty-five feet high, there are figures of men, grotesque figures, flowers, buds jutting out, and other ornaments, indifferently well carved. They project so much, as to be almost separated from the work. A few of these testimonials at Ningpo are falling to pieces, being as old as the thirteenth century; the most recent ones were built in the fifteenth century.—MURRAY and DU HALDE.

At Nankangfoo was seen a considerable number of these memorials in stone, on which the carved relief was remarkably bold, and contained representations of historical events in well-executed work. The inscriptions on some of these proved them to have existed between two and three hundred years.

Another species of memorial, of the same kind, is a large stone slab, called Shepac, being about eight feet in height, two in breadth, and half a foot in thickness, covered with inscriptions, which record some honour conferred by the Emperor, or the merit of some eminent person. These are always erected perpendicularly on the mystical figure of a tortoise, and of the same stone from which the slab is cut.

In the play of "An heir in old age", some one asks, "where are the tigers and the goats of stone?" alluding to the tombs; horses also are sometimes sculptured, life-size, as marks of esteem for particular individuals.

At Tientsin some handsome works of the sepulchral kind were described as the tombs of priests. They were constructed of excellent brickwork, and had an urn-like shape, being



narrower towards the bottom than the top, where they assumed the form of a bulb, and were surmounted with small balls. As the bodies of the Buddhist priests are burnt after their death, and sometimes kept in vases in the temple, the shape of a vase or urn was sufficiently appropriate.—DAVIS.

The general features of the leading divisions of Chinese architecture, with such pictorial examples as may be required to illustrate sufficiently their peculiarities, will, of course, be found treated in the places appropriate to them in a Cyclopædia; for the present purpose, it is sufficient to indicate their names, and to give a clear idea of the impression they produce.—E. A.

#### ESTHETICS.

When a display of English military tactics had, in the year 1841, convinced the Chinese of the expediency of ceding to the "outer barbarians" an inch, when they could so easily possess themselves of an ell of the celestial country, an increased respect for the formidable foreigners, and their ready cash, engaged tribes of artisans in moulding their singular modes of constructing dwellings to the wants, wishes, and whims of Englishmen. Numbers of our countrymen had thus an opportunity afforded them of seeing buildings as they really are, and of qualifying, if not overthrowing the tent and tea-cup system, with which lexicographers have, in times past, rather misled the architectural student.

The visitor, who sails before the water frontages of Canton, will look in vain over the crowd of unpainted boats for the tasteful and symmetrical designs engraved, and often re-engraved from the drawings of CHAMBERS, and he will contrast with national pride the regular, columned, and stuccoed fronts of the Shap sarm hong (thirteen factories) with dingy wide scattered erections of faded blue brick, that constitute the citizens' dwellings of Shearn-shing, the provincial city, where the upper of two stories is entirely fronted with a row of flimsy jalousies, the low pitched roof perhaps in summer protected by a clumsy veil of light boards and bamboo poles, looking as if the house had been caught in a gigantic spider's web while floating down the river. The lower story presents little prison-like apertures in gloomy walls; the front court is defended by a slight wall, ventilated with such quatrefoils as square bricks afford facilities for forming; a gate of bare poles, such as a labourer's cottage-garden in England would be ashamed to own, is set in the centre; and to this there is access by a flight of rude undressed granite steps from the swelling, muddy current of the "Pearl river".—E. A.

The customs, habits, and manners, the wants and resources, the language, sentiments and religious notions of the most ancient society, and the most populous empire existing amongst men, are, without doubt, most interesting subjects for the investigation of the philosopher, and not unworthy the attention of the statesman. But the expectations of the man of science, the artist or the naturalist, might rather perhaps be disappointed, than their curiosity be gratified in travelling through this extensive country. It can boast of few works of art, few remains of ancient grandeur. The great wall, that for a time defended its peaceable inhabitants against the attacks of the roving Tartars, the walls of its numerous cities, with their square towers and lofty gates, and here and there an old pagoda, are its only architectural antiquities; and, when these are excepted, there is not perhaps a single building in the whole extent of China that has withstood the action of three centuries. There are no ancient palaces nor other public edifices, no paintings nor pieces of sculpture to arrest the attention of the traveller, unless it might be from the novelty of their appearance. In travelling over the continent of Europe, and more especially on the classic ground of Italy and Greece, every city, mountain, river, and ruin, are rendered interesting by something on record which concerns them; the theme of some poet, the seat of some philosopher or law-giver, the scene of some memorable action,

they all inspire us with the liveliest sensations, by reviving in the mind those pleasures which the study of their history afforded in early life. To Europeans, the history of China has hitherto furnished no materials for such recurrence; and the country itself is, therefore, incapable of communicating such impressions. In vain should we here look for the massy and stupendous fabrics that appear in the pyramids and the pillars of the ancient Egyptians; the beautiful and symmetrical works of art displayed in the temples of the Greeks; the grand and magnificent remains of Roman architecture; or that combination of convenience and elegance of design which characterizes the modern buildings of Europe. In China, every city is nearly the same; a quadrangular space of ground is enclosed with walls of stone, of brick, or of earth, all built upon the same plan; the houses within them of the same construction, and the streets, except the principal ones that run from gate to gate, invariably narrow. The temples are nearly all alike, of the same awkward design as the dwelling-houses, but on a larger scale; and the objects that are known in Europe by the name of pagodas are of the same inelegant kind of architecture from one extremity of the empire to the other, differing only in the number of rounds or stories, and in the materials of which they are constructed. The manners, the dress, the amusements of the people are nearly the same.—BARROW.

The first knowledge to be acquired in order to appreciate the arts of a people, is that of the spirit of the nation, or the causes which formed its customs, its manner of living, of seeing and feeling, and which from that time must have given a constant direction to all its works. The operation is the same with great and small, with the mass which we call a nation, as with the individual being.

Amongst men there is found a difference of moral faculty, which causes one only to be suitable to those professions where the routine dispenses with reflection, where the labour of the mind never runs parallel with that of the hand, and of which the whole genius lies in the instinct of one uniform repetition; whilst another has received from nature an activity of thought and imagination, which carries him into every sphere to seek and to find continually new combinations. From these two qualities with which the different nations of the earth are endowed, will result with the one in all its operations what is called the habit of stationary routine, and with the other that of necessity of advancement, which, when applied to its productions, is called perfectibility. Now these two effects will be in different countries powerfully seconded by the action of natural character on political elements, and by the reaction of political causes upon the moral faculties of the mind, and upon its operations.

Considering the point at which the arts of China have remained stationary for so many ages, the conclusion necessarily is, that either in the influence of the character of man upon political springs, or in the action of these springs upon the development of moral activity, there is a powerful cause which has at all times contributed to compress, to impoverish, and to render sterile all the germs of invention in Chinese art. If we would believe those who wish to justify China on this point, the government only regards the arts under the aspects of commerce and utility: of what importance shall we say is the opinion of the government? This defence still strengthens the judgment exercised towards the arts and architecture of this country: it may be affirmed that none has preserved more faithfully the first traces of the springings forth of primitive habitations in construction and exterior forms.

DE PAUW is quoted with applause for saying that we cannot deceive ourselves as to the object which has served as a model for their first building: they have imitated a tent. Nothing seems to render a better reason for the singular construction of their habitations, which rest upon their basis even when their walls are overturned: in fact, the walls surround the house without supporting it; they serve only as a shield to the timber

work without supporting the roof, as if from the beginning they had made a more solid enclosure of masonry around the tents to keep in the cattle. Such ought to have been of necessity, with regard to house building, the first step from the pastoral and wandering towards the sedentary life. "When one considers in general," says the above cited author, "a Chinese town, one sees that it is only, so to speak, a fixed camp."—QUATREMERE.

The usual sagacity of the accomplished lexicographer seems to have deserted him, when he allowed himself to be misled into seeking, in the habits of a savage race, for the origin of the architectural habits of their civilized progeny. Admitting, which is almost impossible, that the Chinese ever were a nomadic people, it is known that they were devoted to the pursuits of agriculture before they began to have written history, *i. e.* at least before 550 B.C., when they called the Tartars "Heungnoo" (Huns), erratic nations. It is true that the dominant race, and a large portion of the present empire, are Tartaric; but the truly Roman policy, far from attempting more than one revolution in the habits of the many, has been satisfied with political supremacy, and yields to the ancient civil, criminal, and religious codes. Thus the Buddhist (imperial) faith is only tolerated, while the native Confucians are acknowledged as professors of the state religion; and no trial of the strength of a new and intrusive government has ever been considered so dangerous, as the compulsion of the Chinese, about 1650, to shave the thick hair, which their nation had been accustomed to wear from the most ancient times as a cherished ornament, and to betake themselves to the Tartar fashion of a long plaited tress or tail; the penalty of death was preferred by many to the disgrace of submission, while thousands expatriated themselves. If it be asserted that architecture also was then subjected to the influence of fashion, it only remains to appeal to the pagodas built even so little as two centuries before that time. At some future period, however, the student will take into consideration the probable effects of the Mongol invasion, in 1234, which destroyed the monuments of previous ages.

The materials, the climate, and the religion of the people are, as QUATREMERE himself admits, the guides to the architectural style of their earliest times; it is not until civilization has ensued, that their habits can be seen influencing their buildings: all archaeologists are satisfied with tracing the Greek temples to the simplest erections of beams and round logs of wood; and the more varied designs of the Chinese may be resolved into the following elements of construction: two gable walls of brick or mud, terminated ornamentally without regard to the rake of the roof; and a surface of tiling, carried on a series of round spars as purlins, bedded in the gables; the back may be a solid wall; the front either open, with round wood columns to carry the roof plate, or filled with slight boarding and window blinds; or it may be a wall with a central doorway: this definition will apply to cottage, mansion, and temple.—E. A.

The admirable manner in which the use of the bamboo combines lightness with strength, renders it a most valuable resource to this ingenious and industrious people. Their theatres, their halls of reception on public occasions, and their temporary warehouses for storing goods, are erected at a few hours' notice, and serve equally to exclude the heat and the rain. They can be built of almost any height or breadth required, on account of the extreme lightness of the materials. Not a nail is used in their construction, nor even a cord; but the thin strips of the bamboo bind every part together in a perfect manner; and when the end of their erection has been answered, they are taken down and carried away with equal ease and dispatch.—DAVIS.

The idea of the tent being the prototype of Chinese edifices generally, is an assumption hardly tenable. There is sometimes, indeed, seen an octagonal edifice with the hips of its roof curved, as if in imitation of slack cords, and the tiled

surface between them following the form that would be assumed by loose canvas in a similar position. The copings of gables often terminate at the apex in a curve, and the ridge crest is a canoe-shaped mass of stucco, moulded into a labyrinth of square fretwork.

The temporary buildings of the Chinese, whether erected for the performance of periodical religious ceremonies, or for the lodgings of artisans carrying on any public works, or for other purposes, are constructed in roofs and walls of a kind of thatch, on a framework of poles and sticks, in flat surfaces. The stiff matting, that is spread in segment and semicircular arches to cover boats, forming also the roofs of small cottages, is not suited to cover large tents. The above simple forms have probably been used from the earliest ages, and gradually improved upon; whilst the curvilinear features have been added as ornaments, rather than adopted as coinciding with the elementary principles of their mode of construction.—E. A.

The spirit of lightness is so imprinted on all the monuments of China, that it would be sufficient to define the origin of its house building; and this unvarying people's imitation might suffice to set us a standard, as to the lightness which constitutes the character of their architecture. Thus facts suffice to demonstrate that no shade of an opposite character could have been perceived there, since it is the very want of solidity which in that country constitutes both the foundation of the art, and the means that it makes use of. It is, therefore, very useless to seek either to accuse or excuse this architecture from being what original and inherent causes (whether from the nature of the country, or from the forms of society which has appropriated them to its wants) have forced it to be.

But there is still a characteristic quality which ought to be remarked, if not in what constitutes the fundamental principle, at least in what becomes and forms the exterior effect of Chinese architecture. This quality (more material, in fact, than intellectual) is *gaiety*. We may fairly find, that in no other country could the art of building offer an aspect more flattering to the eye. Masses and double roofs glistening with tints, the effect of which is compared by the Chinese poets to the shadowings of the rainbow; porticoes diapered with all sorts of colours; varnished surfaces extending in all directions; the agreement of this kind of decoration with the light forms of the building; all this should present to the eye a species of gratification, the reality of which cannot be contested; and we cannot doubt, that with a critic who could only have learned to judge of works of art by material action and physical impression, the most beautiful forms, and the most regular proportions, will have less effect in fixing his attention than the brilliancy of colours.

As a quality of the art of building among the Chinese, must be recognized the agreement of its taste for ornament or decoration with its forms and composition. Nothing like that taste for ornaments in sculpture, to which the mind naturally refers when ornament is spoken of, is to be remarked in it. The art of ornamenting a Chinese building is nothing more than that which might give a notion of the art that mechanics apply to the manufacture of articles of furniture or objects of a capricious taste for luxury. In fact, they treat a building, in the department of ornament, as a cabinet. Its beauty consists in the precision of the work and its neatness; they varnish the columns, they colour the roofs, they case the walls with coloured materials; to be the most showy, the most brilliant, the most unchangeable, are the first merits of fine buildings. If figures are painted in them, the merit of the design is last considered. When they would carry to their highest pitch the richness and durability of ornaments, they use colours that fire has rendered unalterable in porcelain.

The most famous monumental edifices—the palace of the Emperor, the towers which have been mentioned—shine with the brilliancy of these substances—reserved for the honour of the gods and the sovereign.



As for the art, properly so called, of ornament in China, it is nothing more than the art of cutting open-work patterns. Thus it is in these designs that the Chinese excel: their furniture, their seats, their tables have, in this work, a charm that the inexhaustible resources of the artizan knows how to multiply to infinitude. The sashes of the windows exhibit every imaginable pattern, a fact as regards all oriental nations.

Open work designs occupy rather a considerable position in buildings; it is this that would seem to correspond to the part of our arrangement that we designate the frieze. It appears, then, that all the branches of the Chinese art of building are in complete accordance with each other. No style, no foreign taste having been permitted to mingle with theirs, this art has received its development in a manner conformable to the unchangeable wants and resources of the country and of the genius of its inhabitants.

Thus the established line of practice holds, and has held Chinese architecture for a great number of ages in a stationary existence, whence it is hardly allowable to believe it capable of emerging. Perhaps, in fact, all that in art has had time to suit itself to the uniform and few wants of an immense population, isolated by a variety of causes from all other people, seems as if it should be equal in duration with that people itself.—QUATREMERIE.

MEMORANDA CONCERNING THE ERECTION, BY NATIVE ARTIZANS,  
OF AN ENGLISH HOUSE IN CHINA, DESIGNED AND  
SUPERINTENDED BY THE ENGLISH ARCHITECT.

The evidence that a bargain had been struck between the English merchant and Chinese contractor, appeared on my plans in the form of a perpendicular column of characters neatly traced with a brush and Indian ink. My employer would not have the specification translated. "You'll have no difficulty with Achone," he said, "he's been a ship carpenter, and is well accustomed to building for the Europeans, and he'll do anything you ask him. They're infernal rogues, these Chinamen, confounded rogues, *all* of 'em, but they know I'm too deep for 'em, they can't cheat *me*." The foundations being laid about four feet thick, of long masses of granite as large as a milestone, I felt there was less necessity to oblige the contractor to dig up some large natural rocks that interrupted the level of the trenches. We had a serious difference of opinion, however, about these rocks; Achone declared that if they were extracted, the soft bed underneath them would swamp the footings. I was pleased to observe a proper English mason's level employed in place of the clumsy water trough generally used by the Chinese. The three customary courses of granite ashlar, above the plinth, to keep out *laleeloons* (thieves), were a long time in laying. I admired the patience of the masons, each perched upon a block, punching with iron hammer and chisel steadily through the long, long summer hours, snatching only a few moments for the simple refreshment of little else but rice and tea, and a few whiffs at a pipe, without stepping off their block.

When the granite window-sills were laid, each having a central perpendicular stroke struck with a line wetted with muk suey (Indian ink,) and brought accurately to coincide with the centre of the window marked on the masonry below, and the jambs were set up, the bricklaying began. The face of the wall was kept exactly flush with the granite below, leaving not a quarter of an inch for plastering. The grey-headed—I mean grey-tailed, veterans of the trowel had never thought of this, and vociferated most fiercely when made to pull their work down by the foreman.

I was dumb-founded to see the plasterers treading on the heels of the bricklayers, and laying on the pricking-up coat as fast as the wall rose in height; being very thin, this plaster is not disturbed by the settling of the brickwork. Screeds were altogether rejected as wasteful; indeed the forming them would have been impossible, for to save scaffolding one part of the wall was always carried up nearly ten feet higher than others.

Achone was very troublesome about his instalments, which were paid at the merchant's treasury, on his presenting my certificates. He was to have one thousand dollars to begin with, a thousand when the foundations were in, and another when the first floor joists were laid. He had taken his contract so low, or ready money commanded such discount, that he quite led me a life.

One day, whilst the round spars were laying as bridging-joists upon some old masts as girders, that had already "put a girdle round the earth" in the merchant service, Achone put the question: "Can let my have thousand dallar now?" "No, you must do some more work first." "My wantshee catchee thousand dallar first. Have got twenty-five piece carp'nter man, forty piece coo-lee (labourer), thirty breck may-sun: suppose no got moa-ney, no can give wage dat man: you see—all dat stun foundation very large stun; eb'ry day I go out, dat coo-lee come talkee my—why no give moa-ny!—chery day wantshee moa-ny, buy dat rice;" and in his agitation he inserted a great fan under his white jacket, and began to ventilate his spine most vigorously. "Inside my heart werry sore, no can catch wage; all dat coo-lee man come roun my ous, make *to--o* much barbery,—say,—Achone! Achone! You all same tief Achone! Talkee too much bad my." "Well, why don't you send to Canton and get more joists?" "My *hab* sendee Canton. No can buy spar, no got *moa-ny*. You gib me thousand dallar, my catchee dat Cheena spar werry soon." And here Achone, overcome with sadness, lifted up his voice and wept. There is something remarkably touching in the sight of a strong, stout man shedding tears. "I never," as Corporal Trim says, "in the longest march, had so great a mind to my dinner, as I had to cry with him for company."

As soon as he was gone, I proceeded to the house of my employer to plead for him. "Is Mr. S. in," said I to a loitering, effeminate Chinese lad, with a smooth shaven head, after having doubtfully walked to and fro in the veranda, and knocked with very little effect at four or five sash-doors; "He av go out, wat choo want-shee, you makee house pigeon?" I acknowledged the compliment to the profession with a nod to the youth, and went to meet Mr. S.

"Oh, Mr. —," said my employer, "when *you* know the Chinamen so well as *I* do, you won't be so tender-hearted as you are now: why that scoundrel Achone, living as he does rent free in a mat shed on my premises, dirtier, and more meanly than his men, he's one of the richest Chinamen in the place! No, no, let all the joists be laid first; he's got his thousands of dollars out at fine interest, *I'll* take an oath."

To return to the building: I had shewn my greenness in placing the strong room for the dollars against an outer wall, accessible to house-breakers; this was altered. We were now working at the level of the first floor, where the sitting rooms were to have fireplaces. To avoid corbelling, the joiners nailed a single floor board close to the wall, and banded the brick jamb upon it. Every means was employed to save bricks, the windows gaped inwards with splays, that placed the lintels in a critical position. The granite door-jambs had awkward projections left for pivots to work in, instead of proper hook and twist hinges. When the marble hearths came, quite an excavation had to be made in the round spars, which could not be trimmed, and ran their inflammable ends into the fireplace, and the hearth could not be got down flush with the floor. It was useless to remonstrate; Achone knew that Mr. S. was satisfied with the regular way of doing things.

Part of the first floor was to be a veranda, with Doric columns and entablature; I had profiles cut for the rough brick work, which Achone vowed should be executed to a nicety, leaving three quarters of an inch for plastering everywhere. Unfortunately, I was compelled to leave the men to their own devices for a few days, and Achone to his opium pipe. When I came back—good heavens! what was the veranda like? The pillars were right in height, but the coupled columns were

stuck together; the bases, two clumsy toruses, in form something between a turnip-radish and a pumpkin; the capital was a single meagre tile. After having the columns reconstructed, the stucco work began. All the fillets and squares leaned inwards, the soffit of the architrave cut an inch deep into the abaci, the triglyphs were pentaglyphs, the cornice the masons would not project more than the half of a twenty-inch tile instead of nearly two feet (I got it done eventually with granite slabs). Instead of the plain blocking course designed, I found the industrious plasterers flourishing away in flowery enrichment, of a series of little piers, projecting from other slight projections, so that each division of the attic had six arrises, and the corresponding mitres in the moulding coping, to say nothing of intervening panels, all filled with elaborate designs. It seemed a sad pity to have to abolish all this exuberance, especially as the contractor never dreamed of an extra for it.

For the roof we had provided king post trusses; and when these were set up, the carpenters began to bed the hip pieces; four clumsy round pine logs—they were tied to nothing, had no square bearing anywhere—being just bedded in the brick walls, and the purlin spars rested on them. Upon these the tiles lay, bearing on battens rafterwise. The entablatures over the windows were great difficulties; in these the Chinese generally keep the return of the upper fillet within the width of the window dressings (see figs. 9 and 14); and when I ordered the extra length, they ran all the members out alike. I corrected this by tracing the return of the bed-mould against the wall. Then they cut crown mould and all off to this mark, and had to insert bricks again to repair their mistake. Every morning some blunder stared me in the face. One day I found all the window outside architraves painted green to match the jalousies.

A large shed, shaggy with its thatch of dryleaves, close to the building, accommodated the joiners. Here they got up the sash doors, which are commonly used to both doorways and windows to assist the ventilation: preparing the stiles on little forms, not more than six feet long, the bench sloping from about twenty-four inches to twelve in height. With a narrow plane, destitute of top iron, and worked with a cross handle, the workman sitting astride his work, it was wonderful to witness what true and smooth work they put out of hand. It appeared rather barbarous, indeed, for a man to be turning up his naked toe and holding a sash-bar with it on the bench, while he worked the moulding and rebate. They were not so *au fait* at fixing. To my dismay, I found the doors, two inch double-worked doors, hung with brass butts, before the floors were laid; there was no fear, to be sure, of the doors not shutting, as there was above half an inch clear of any possible floor board, and when the floors were down, there was little more cause for satisfaction; huge ragged-headed brads attached them to the round spars, that could not be termed joists, and where an inequality presented itself, a dull adze scrubbed off the raised edge.

Mitering the moulded architraves was always a difficulty; the bead had to be shaved down, and the faces curved at the intersections.

The carving was worse than the joiner's work. A console truss to a door cornice they incised in flat lines on a half inch board, though shown the front and profile on paper; and when a deal block was got out, the carver played with it as a cat with a mouse, and I was obliged to hack it out myself by inches to show him the way. A model would have helped on matters much, for but few workmen could understand a drawing.

Long before the building was finished, all the joints of the panels of the doors and sash door windows gaped wide, and let in streaks of the withering rays of the sun most provokingly. The cedar treads and risers of the stairs also shewed seams most unseemly. We made a cylinder in the well hole and chalked up the handrail pretty correctly. The greatest proof, perhaps, of want of civilization shewed itself in forming the access to the cellar in the staircase compartment, about fifteen feet square.

ARCH. PUB. SOC.

Instead of contriving the descent under the staircase, they boarded the whole floor before beginning to build the staircase, and sawed out a large square trap in the centre of the apartment to get at the cellar. For the balustrade to the verandah, which was to be of grey porcelain, they brought several stone bottle-like productions, glazed, which could be produced at about half a dollar each. I gave them a profile, which they executed with very round arrises.

As soon as the rooms were floored, the workmen, who had been roosting at night like fowls on little perch-like platforms in the roofs of the temporary workshops, brought their beds (little more than mats) into the house, and there some of them lay sprawling and fanning themselves through the day. This appeared much more innocent than an English mechanic's week's "fuddle"; nevertheless I said to Achone, "Why do you let your men leave their work and smoke?" "Cheenaman", he replied, "no all same Inglis-man. Spouse Inglis carp'nter ten minest away from walk, stoppee he wage—Cheenaman no all same. Dat man (pointing to one) stun may-sun, to day he no got walk, to-morrow he catchee walk, nex day spouse no got—spouse rain come, he catchee lice (rice);" that is, in rainy weather, when they cannot work, there is an allowance of rice to the mechanics, who get about the third of a dollar wages per day, or sixteen pence; labourers about sevenpence half-penny.

Centre flowers of radiating acanthus leaves, were most patiently modelled against the ceilings of the best rooms, and in tolerable imitation of my drawings, but in a few days they cracked and fell to pieces, whilst the quaint sprigs, birds, and fishes, shaped by the plasterers out of their own heads, set beautifully hard; seeming to say, this is a land of old institutions, new fangled notions will not answer here.

At an early stage in the works one of the ground floor rooms was furnished thus; against the wall were some upright boards, about seven feet high, the upper part covered with orange paper, inscribed with black characters, and in some parts punched into rows of diamond-shaped apertures, and spangled with square spots of gold leaf, its surface further diversified with little bouquets of tinsel, fructifying most gloriously with red and green gems. A small table stood close to the boards, on it were two earthenware lampstands, a little blue and white teapot, some diminutive basins, a vessel containing a large green fruit, and some matches, or incense sticks, in stands.

This altar was in honour of Lu Parn, or Lao Parn, the "opifer per orbem dicor" of Chinese carpenters. His interesting biography was thus touched upon by Achone: "He lib long time go, he werry cleb man,—savey all dat carp'nter pigeon (business), all dat stun walk, all same Inglis man (I bowed) savey make—all carp'nter man, all breck may-sun, all stun may-sun, chin chin he (worship him). Ten thousand year,—more, he makee die, go upside sky—make dat emp'rrers house. Emp'rer makee he mandaree, he werry prarper man, all same school master; when got werry hard walk all man chin chin he (invoke him), all same Inglis man talkee chin chin Jos" (idol worship). "Well, but," said I, unwilling to appear to assent to his mythology, "Englishmen will tell you that 'Jos pigeon' is only fools' pigeon. There is only one God, and Chinamen have no more. He does everything well, and will not allow what is bad." "Oh, yes, my savey dat Gott berry well, he all same Jos." "No, he is not all same Jos." "Yes, my savey dat Gott, my likey Cheenamen Jos more better; Cheenaman Jos let him makee walk, catch wage S'nday. Inglisman Gott say no walk S'nday." Achone was too courteous to stick to any opinion he advanced when opposed by me, so it became in matters civil as well as religious, useless to "argue the point" with him.

We have yet to describe the plumbing, painting, and glazing, to complete our mansion. Of the first we may safely say there was none, the hard lime furnishing the linings of all the gutters, and the water closets being on the night-table principle.

F



Paint is laid on sometimes in almost a paste, with a piece of chip, and is very glossy when dry. Glazing is done as with us. The Tong yao fool, lime and oil (putty) is as indispensable to Chinese joiners as to the English, and the glaziers, accustomed to work their oyster shell into labyrinthine compartments of carved casements, find sash squares very easy to stop in.

We have thus imperfectly traced the progress of construction, and the difficulties which occur in the erection of an ordinary English house, where all is square work, line and rule work. A little reflection on the clumsiness and inaccuracy displayed by

Chinese artisans in such simple constructions, awakens our wonder at the truth and correctness with which the complicated curves of elaborate temple roofs are produced, bristling with porcelain dragons, fishes, frets, and scrolls, exhibiting contortions of caves, board, gable, ridge, and hip, setting geometry at defiance, and yet in a manner symmetrically subservient to some of her rules, seeming, in the quaint contour of their fantastic crests, to be less the productions of a plodding, persevering, unchanging people, than the magic creations of a race of fairies.

EDWARD ASHWORTH.

#### DESCRIPTION OF THE PLATES.

- PLATE 1 shows the exterior of the only good Chinese mansion existing at Victoria, Hong Kong, in 1845, when the picturesque screen was pulled down to give place to three shop frontages. There is a small garden within the screen. In the lower subject, the naked purlins seen through the open jealousies determine the style of interior finishing of a private house.
- PLATE 2. An interior view in the house represented in plate 1. The joiner's work is all of pine, coated with green paint and varnished. A spangling of gold enriches the sash doors. The walls (externally to the verandas) are naked brick, the ceilings boarded.
- PLATE 3. Fig. 1, a Temple, not, as is usually the case, open all day. The transom beams and sculptures to the pillars are all in granite, the ties between the pillars and wall behind of wood. The palings to this and Fig. 2 are simply boards, about one and a quarter inch thick, painted red. Fig. 2, part of a tea merchant's dwelling at Canton; and Fig. 3, the front of a Temple at Macao.
- PLATE 4 shows shops of a grade superior to those in Plate 5. These, however, are all open by day to the winter's cold. The poles and boards seen above the roofs are to shelter the street, only perhaps eight feet wide, from the sun.
- PLATE 5. A street in Macao, the Chinese part of the town. These shops are quite second rate. The foolish custom of constructing segment roofs to verandahs is here displayed to disadvantage.
- PLATE 6. Fig. 1 is the roof of a large warehouse on the "Surrey side" at Canton. It is genuine Chinese. Fig. 2 may have been infected with the English Queen's dominion at Victoria, Hong Kong. Fig. 3 shows the mode of transporting heavy weights. Fig. 4, from a warehouse at Canton, is a specimen of native carpentry. It wants the purlins to be complete. Fig. 5, are the punchcons to a larger scale; and Fig. 6, another example of Chinese construction.

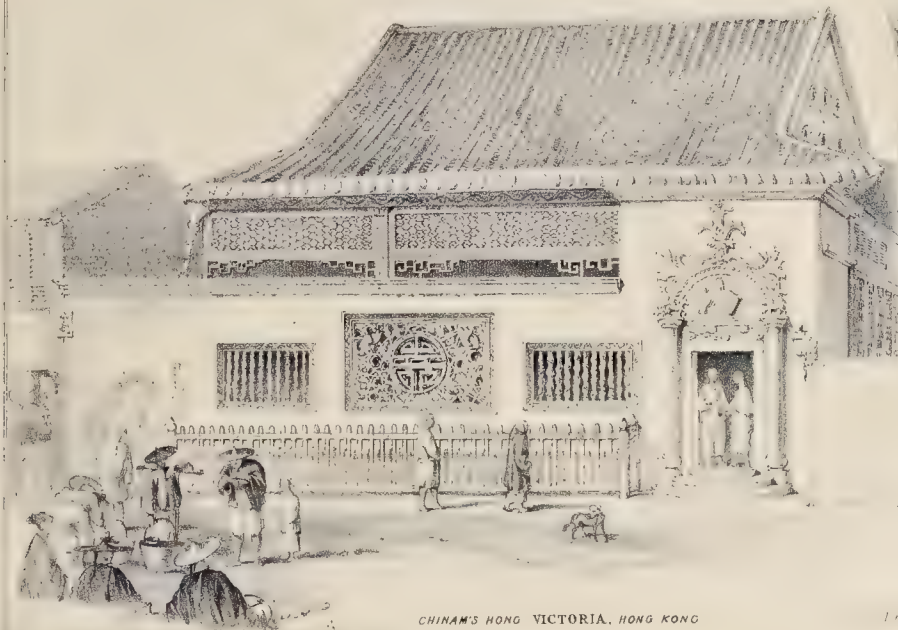
The following publications upon the history and manners of the country include those referred to in the text. The earlier works will be found to be foundations of those of later date, as few of the modern writers, excepting those who accompanied the embassies, have had the privilege of ascending the country to make their own observations.

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*Etat présent de la Chine*, fol. Paris, 1697; BORGET, *Sketches of China and the Chinese*, fol. — 1842; R. BURFORD, *Description of Canton*, etc., 8vo. London, 1838; SIR W. CHAMBERS, *Designs of Chinese Buildings, Furniture, etc.*, engraved from original drawings made in China, fol. London, 1757; and, *A Dissertation on Oriental Gardening*, 4to. London, 1772; *The Chinese Traveller*, being a history of China, collected from Du Halde, Le Comte, and others, second edit., 2 vols., 12mo. London, 1775; J. F. DAVIS, *The Chinese*, 2 vols., 12mo. London, 1836, and 4 vols., 12mo. London, 1844-5; [DELA TOUR] *Essais sur l'Architecture des Chinois, leurs Mœurs et Usages*, 8vo. Paris, 1803; CAPT. ELLIOT, *Views in the East, comprising India, Canton, etc.*, 2 vols., 8vo. London, 1833 and 1838; H. ELLIS, *Journal of the Proceedings of the late Embassy (Lord Amherst's) to China*, 4to. London, 1817; JOAN GONCALVES DE MENDOZA, *Historia de las cosas mas notables, ritos y costumbres del gran Reyno de la China*, etc., 8vo. Roma, 1585; 8vo. Venetia, 1586; 8vo. Medina, 1595; 8vo. Anvers, 1596; 4to. Antwerp, 1655; C. GUTZLAFF, *China opened*, 2 vols., 12mo. London, 1838; *Journal of Three Voyages along the Coast of China in 1831-2-3*, etc., 12mo. London, 1834, third edit.; and *A Sketch of Chinese History, Ancient and Modern*, 2 vols., 8vo. London, 1834; J. B. DU HALDE, *Description Geographique, etc., de la Chine*, etc., 4 vols., fol. Paris, 1735, Englished by R. Brookes, 4 vols., 8vo. London, 1736; — HUC, *Souvenirs d'un Voyage dans la Tartarie, le Thibet, et la Chine, pendant les années 1844, 5, and 6*, 2 vols., 8vo. Paris, 1850; E. YSRANTS IDES, *Journal of an Embassy from the Emperor of Muscovy to China*, 8vo. London, 1698; and *Three Years' Travels from Moscow to China*, 4to. London, 1706; ROBEKI, VISCOUNT JOCELYN, *Six Months with the Chinese Expedition*, 8vo. London, 1841, second edition; S. KIDD, *China*, 8vo. London, 1841; A. KIRCHER, *China Illustrata*, fol. Amsterdam, 1667; — LANGDON, *Ten thousand things relating to China*, 8vo. London, 1842; LOUIS LE COMTE, *Memoirs and Observations made in a late Journey through China*, 8vo. London, 1697; and, *Memoirs and Remarks made in above Ten Years' Travels in China*, 8vo. London, 1737; JOHN MACLEOD, *Voyage of His Majesty's Ship Alceste to China*, etc., 8vo. London, 1818; J. MAILLAI, *Histoire générale de la Chine*, 13 vols. 4to. Paris, 1777-85; W. H. MEDHURST, *China, its State and Prospects*, etc., 8vo. London, 1840; *Mémoires concernant l'histoire, etc., des Chinois par les Missionnaires de Peking*, etc., 16 vols., 4to. Paris, 1776-91-1814; DR. MORRISON, *A View of China*, 4to. Macao, 1817; ALEXANDER MURRAY, *Doings in China in 1841-42*, 12mo. London, 1843; HUGH MURRAY and others, *An Historical and Descriptive Account of China*, 3 vols., 8vo. Edinburgh, 1843, third edit.; LE PERE NOEL, *Des Chinois*, 7 vols., 18mo. Paris, 1784; P. OSBECK, *Voyage to China*, etc., 2 vols., 8vo. London, 1771; J. OUCHTERLONY, *The Chinese War*, etc., 8vo. London, 1844; G. PANTHIER, *Des Chinois*, 8vo. Paris, 1837; JO. CORN. DE PAUW, *Recherches Philosophiques*, translated by J. Thomson, 2 vols., 8vo. London, 1795; REV. G. SMITH, *Narrative of an Exploratory Visit to the Consular Cities of China*, etc., in 1844-45, 8vo. London, 1847; H. C. SIRR, *China and the Chinese*, 2 vols., 8vo. London, 1849; M. SONNERAT, *Voyage aux Indes occidentales et à la Chine*, 2 vols., 4to. Paris, 1782, and 4 vols., 8vo. Paris, 1806, with plates in 4to.; SIR G. T. STAUNTON, *Account of Lord Macartney's Embassy to China*, 2 vols., 4to. London, 1797, and 1 vol. folio of plates; *Ta tsing leu lee, being the fundamental laws of China*, 4to. London, 1810; and, *Miscellaneous Notices relating to China*, etc., 8vo. London, 1822; G. N. WRIGHT, *China, in a series of Views displaying the Scenery, Architecture, Social Habits*, etc., by T. Allom, 4 vols., 4to. London, 1843 and 1849.

Plate I

CHINESE ARCHITECTURE.



CHINA'S HONG VICTORIA, HONG KONG

J. G. Smith

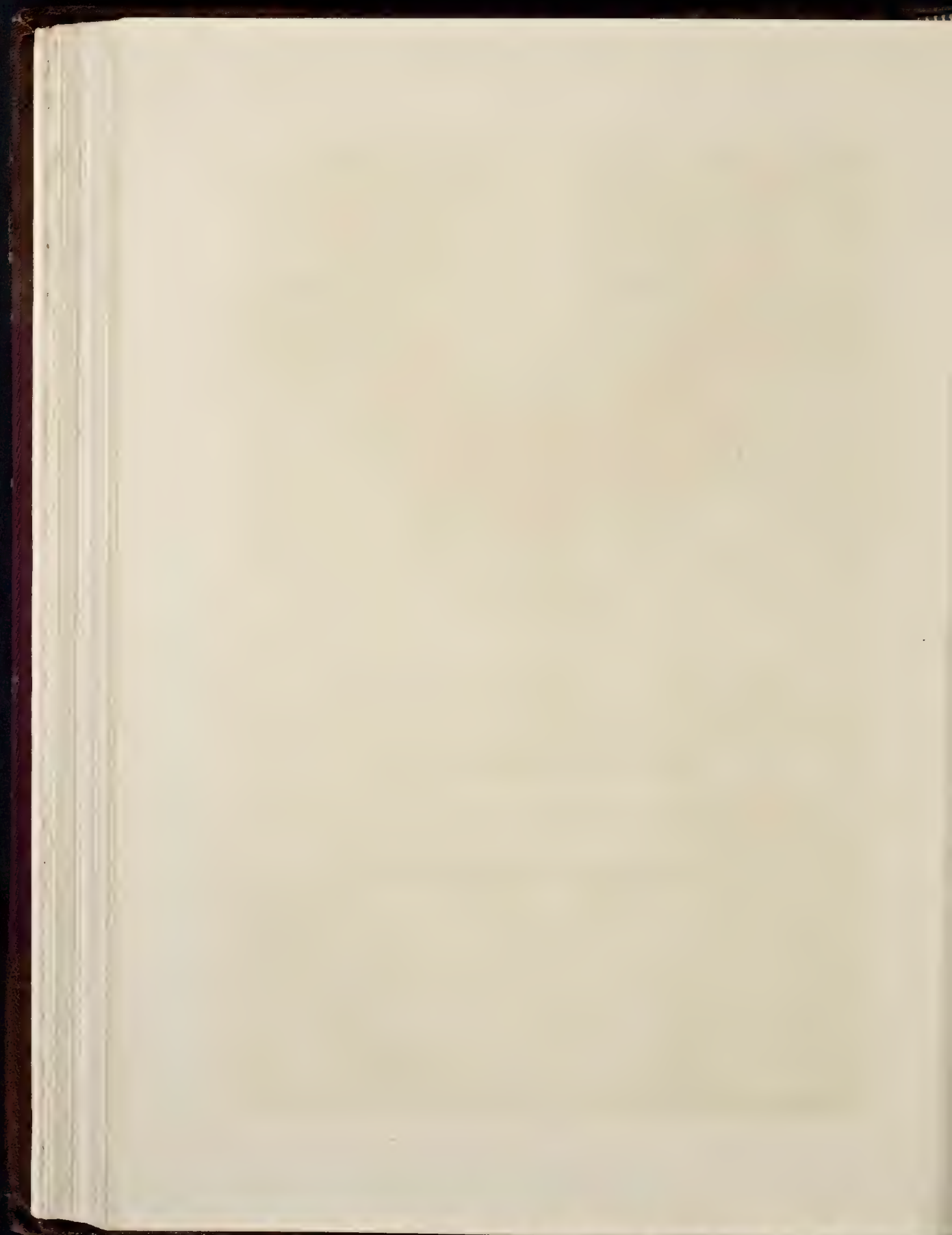


PRIVATE DWELLING HOUSE CANTON

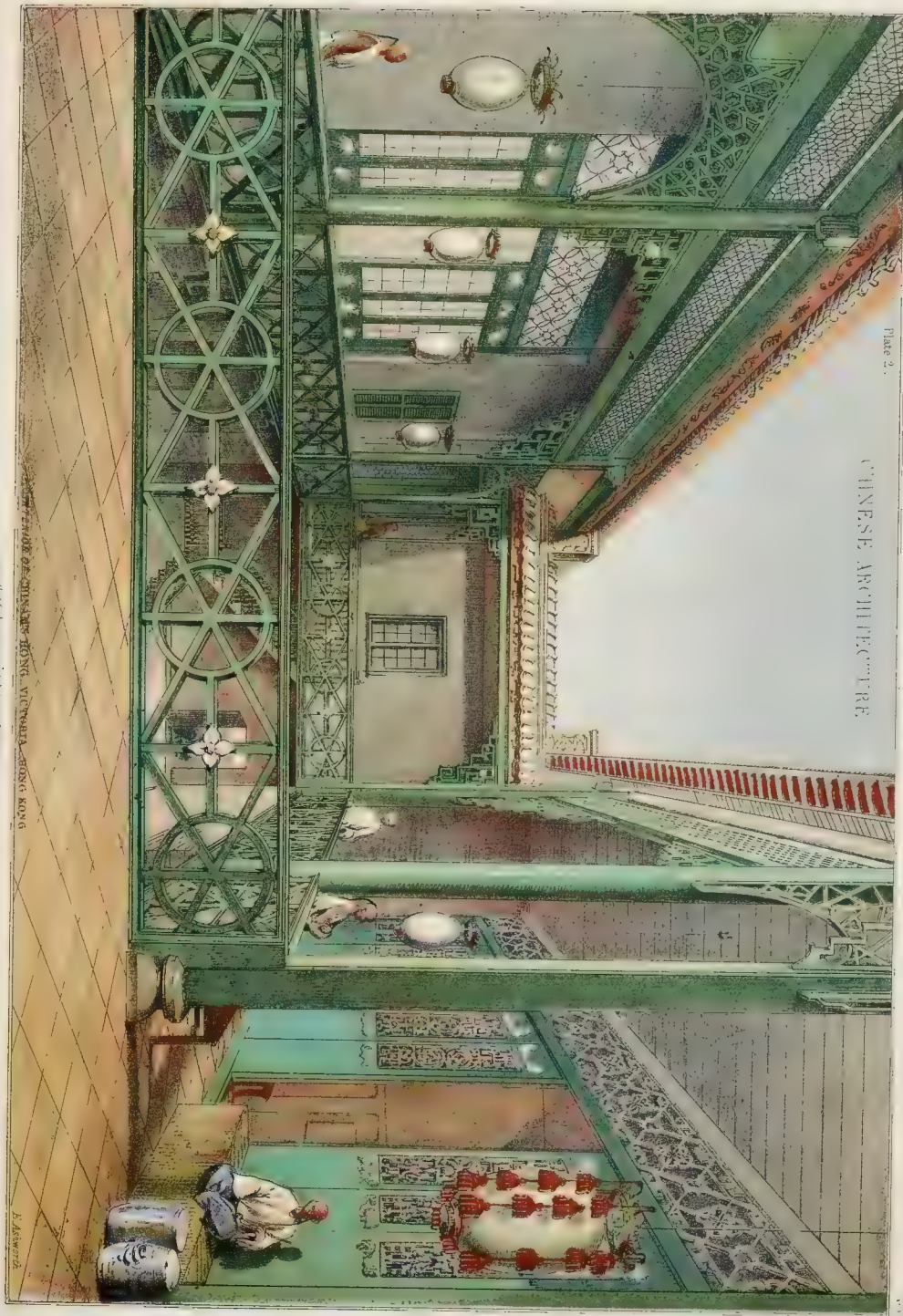
E. Ashworth

Lithographed by Messrs Day & Son, Sep 30th 1851





CHINESE ARCHITECTURE



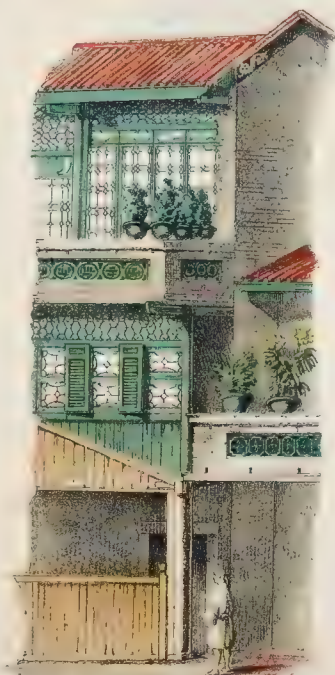




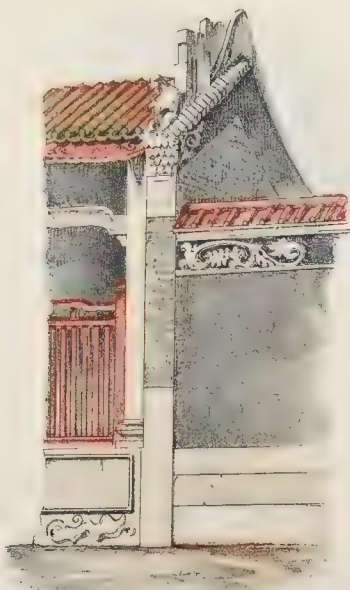
CHINESE ARCHITECTURE



MID-FONG CANTON



TEA MERCHANTS DWELLING HOUSE  
CANTON



GATE AND TEMPLE  
MACAO





CHINESE ARCHITECTURE



Street scene in AN TON, with the "P" shop buildings





Plate 5

CHINESE ARCHITECTURE



P. A. Schworth

CHINESE STREET. MACAO.

After a sketch by Mr. H. J. ...

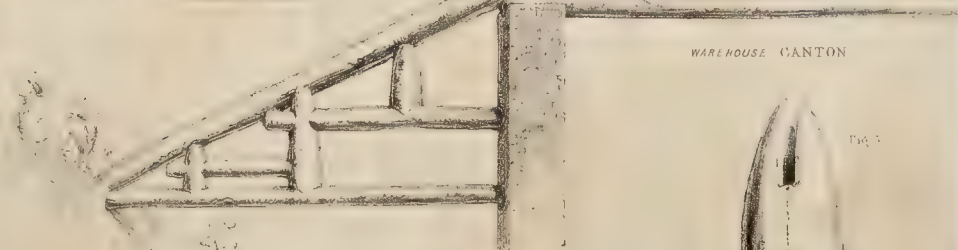




CHINESE ARCHITECTURE



CLOTH WAREHOUSE CANTON



WAREHOUSE CANTON



Fig. 5

PURLIN

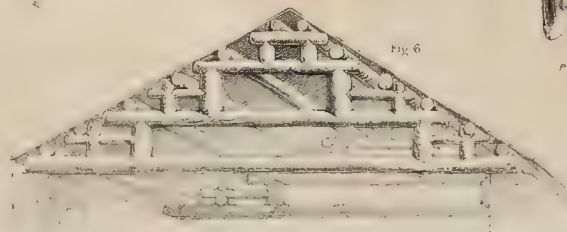


Fig. 6

F. Ashworth

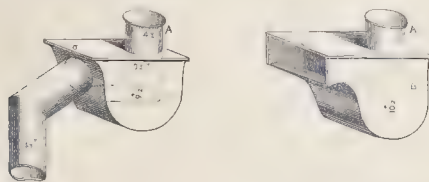




# THE DICTIONARY OF ARCHITECTURE.

## DADO

**D TRAP.** A box, made of milled lead weighing from 6 to 8 lbs. to the foot, forming a trap to the pan or valve water closet; it is in the form of the letter D (U), from whence it derives its name. A similar trap, more generally used for long basin closets without iron apparatus and soil pipe, is called from its shape a P trap. The trap in both instances is made by the "dip-pipe" A B, that enters or dips about 1½ in. into the water at B, which always stands at the level of the exit, and such dip prevents the ascent of the foul air. The joint at A is the junction with the iron closet, or the "long basin", at the level of the floor boards: it is made with putty, canvas, twine, etc., and is called the "tarf joint".



The sides, bottom, and top of these traps being soldered together at right angles, the sectional form of the channel is changed; the S trap is preferable for its exemption from this defect. P TRAP. PAN CLOSET. S TRAP. WATER CLOSET. A. A.

DAB, see DAUB.

DABOD in Egypt, see PAREMBOLÉ.

**DACCA.** The capital of the district of the same name in the province of Bengal in Hindostan. Thatched dwellings, built with bamboos and plastered with clay, form narrow and crooked streets running a short distance from the bank of a river, which is occupied for about six miles in length by the town and its suburbs. An English church in a Pointed style, and an Armenian chapel, are the chief modern edifices, besides the European houses placed among the jungle that is covering the ruins of temples, palaces, and bridges, which seem to have been chiefly erected under the Mahomedan rulers, according to the illustrations given by DOYLEY, *Antiquities*, fol. Lond., 1814. 14. 50.

**DACRYDIUM FRANKLINII**, the Huon pine. A native of New Zealand, belonging to the yew tribe, and producing timber valuable for ship building, for which purpose it is occasionally imported. It is of a remarkably beautiful light colour, singularly marked with dark spots, especially towards the lower part of the stem; and it contrasts well in cabinet work with the *ACACIA melanoxylon*, or black wood. 71.

**DACTYLOS**, see DIGIT.

**DADO.** The Italian name, for a tessera or die, applied not only to a precisely plain cubical form, but to any pedestal. The

ARCHITECTURAL PUBLICATION SOCIETY.

## DAGO

word 'die' in English is restricted to the main body, the plain or panelled surface between the cornice or plinth, of a **PEDESTAL** placed under a column or pilaster, while 'dado' has been adopted for the space between the plinth or *base*, and the capping or *surbase*, sometimes called the dado molding, used as finishings at the bottom of the walls of a room: when these three are used together, the whole is called a 'dado', and sometimes a 'continuous pedestal'. The latter term is the most correct, as the fashion of decorating apartments with small columns and pilasters naturally led to the introduction of their pedestals, which was followed by the extension of their moldings along the walls. When columns and pilasters ceased to be employed thus, the continuous pedestal was retained to protect valuable finishings from accident, or to lessen the quantity employed; about the year 1800, however, the plinth or base alone was used. The continuous pedestal with its moldings, made of various materials, rose to about the height of a chair back, or above 30 ins. from the floor. Some wooden dados were panelled, in order to obviate the appearance of cracks at the joints of the deals forming the die or plane surface, which sometimes shewed, even when the "whole deal clamped dado" of 1787 had been properly ploughed and tongued, and keyed transversely at the back, being caused by the stuff being prevented from shrinkage or expansion when the plinth and capping, through ignorance or carelessness, had been nailed to it. Since 1825 the height of the plinth or skirting, when employed alone, has so much increased (viz. to 15 or 18 ins.) that it has assumed the appearance of a dwarf dado. The cracks were also avoided by making the dado of cement or plaster and fixing the wooden surbase on a ground prepared to receive it. The base and surbase are now usually run in cement. SKIRTING. 1. 2. 4.

**PALLADIO** uses the word *dado* for the abacus of his Tuscan order.

**DAGOBA**, **DAGOPA**, **ДАГОПА**, or **DHAGOBAN**. The Eastern *stūpas* strictly speaking, *topes*, or *tumuli*, says FEROUSSON, *Handbook*, 8vo., London, 1857, p. 8, "are not distinguishable from one another in external shape, though they differed considerably in the purposes for which they were designed, and in the feelings of veneration with which they were regarded. The most important of these purposes was the preservation of relics, the worship of these objects being one of the principal characteristics of Buddhism. In some of the *topes* which have been opened regular relic chambers are found, some still furnished with the relics themselves, others plundered of their treasure. These were properly designated as *dagobas* (from *dhatu*, relic, and *gabba* or *garba*, shrine or womb), of which the word 'pagoda' appears to be a corruption. Other *topes* have been found to contain neither relic nor relic-chamber, and these must have been erected to mark some sacred spot, or com-



memorate some event in the history of Buddha or of his religion."

It is necessary, however, to notice that this inference neither holds good to the extent indicated by the same author, *Picturesque Illustrations*, fol., London, 1847, p. 15, that the distinction "is of the utmost importance to the understanding of the subject, if not in ancient, at least in modern times": nor does it agree with his own remark that "in no work, ancient or modern, known to him, is a line of distinction drawn between these two classes of monuments,—the *Mahawanso* calls them almost always *dagobas*, and FA-HIAN, on the contrary, calls them all *thas* or towers, without reference to whether they contain relics, or are erected to mark sacred spots or to commemorate events". Moreover it does not coincide with his own inference, *Handbook*, p. 19, that in some cases "it is more than probable that originally the relic was not placed in the *tope*, but on its *top*." The consideration of the *sthupa* or *TOPE*, called *dagoba* in Ceylon, and *prachadi* in Siam, is therefore deferred.

Dagoba, as it is usually written, is a structure which in a Buddhist temple occupies the place of an altar or table in a Christian church. FERGUSSON, *Illust.*, p. 6, also calls it *chaitya*; and ERSKINE, *churna*; which latter is probably caused by a mistake made by DANGERFIELD, who in the LITERARY SOCIETY OF BOMBAY *Transactions*, 4to., London, 1820, ii, 202, appears to have confused the words *chati* and *chaitya*. This shrine, or model of a shrine, appears to have been originally an imitation on a small scale of the architectural tumulus, which almost always consisted of a low circular basement or drum, surmounted by a hemispherical or elliptical dome that supported a square block covered by a roof called the *TEE*. The square block is considered to represent a relic casket by FERGUSSON, *Handbook*, p. 19, and is included by him in the description of



the tee itself, in the *Illustrations*, p. 6, of the general appearance of a *chaita* (or worship) cave or temple to Buddha. He notices "a semidome terminating the nave, under the centre of which always stands a daghopa or *chaitya*." In the oldest temples the daghopa consists of a plain circular drum, surmounted by a hemispherical dome crowned by a tee, which supported the umbrella of state. In the earlier examples this was in wood" (remains of one exist in place at Karli), "but in the more modern caves the ornaments of the daghopa, the umbrella of state, etc., are repeated in the rock, although the same forms are preserved. In front of the more modern daghopas there is always a sculptured niche containing a figure of Buddha with his attendants"; and p. 17, describing the cave numbered 10 at Ajunta, he says that "the daghopa is plain and solid, without any ornament, except the square capital or tee on the top, but there can be no doubt that it was once richly ornamented, probably in wood, for which some mortices remain; and that it was crowned, as at Karli, with three umbrellas." Also in speaking, p. 21, of the cave numbered 19, he states that "the most interesting feature is the daghopa, which has here the three umbrellas in stone rising until they touch the roof; in the front of the daghopa is a figure of Buddha standing." Of this he again, p. xi, says, "the dagopa in particular is the most perfect one I know of, and the only one that has the tee with the three umbrellas in stone; and enables us to supply several deficiencies, not only in other caves, but in the great structural dagopas, which generally are shorn of this appendage, which, however, existed in all, and is the origin of the three and nine-storied towers of China." At pages 5 and 27, FERGUSSON also notices that in a vihara or monastery cave at Baug the statue of Buddha is replaced by the daghopa; "but this is, I believe, a solitary instance of its existence in a vihara cave": and p. 29, the performance of the part of a lingam, in the worship of Siva, by a mutilated daghopa. Mention is also made, p. 35, of a vihara cave at Kannari, with two sanctuaries, each containing a daghopa, and an explanation is offered of the existence of three daghopas at the threshold of a *chaitya* cave at the same place. Both the

Ajunta daghopas are clearly illustrated by this author; and there is a fine example at Dhoomnar, according to TOD, *Annals*, 4to., London, 1829, ii, 724. AVRUGABAD.

DAGON or DAGOUNG in Birmah, see RANGOON.

DAILWARRA or DILWARRA, corrupted from *devul-warra*, 'the place of temples'. A site, upon the top of Mount Aboo, in the province of Ajmeer in Hindostan, on which are many Sivite and Jainite inscriptions, the most ancient temples having been dedicated to Siva, as Achilesa, so early as the seventh century of the Christian era: Jain temples of the eleventh century also occur, but the objects of chief importance are monuments, belonging to the thirteenth century, erected to different Jainite saints. FERGUSSON, *Handbook*, 8vo., London, 1857, p. 70, says that "on this hill are several Jaina temples of considerable beauty and extent, but two preeminently so, being built of white marble" (from some place in Cutch, at least two hundred miles distant), "and ornamented with all the resources of Indian art of the age in which they were erected. The more modern of the two was built by two brothers, rich merchants, between the years 1197 and 1247, and for delicacy of carving and minute beauty of detail stands almost unrivalled even in this land of patient and lavish labour." A view of this temple, not very correct, is given by TOD, *Travels*, 4to., London, 1839, p. 101, with a long description, which almost appears to justify his assertion that "beyond controversy this is the most superb of all the temples of India, and there is not an edifice besides the Taj Mahal that can approach to it." The statement that the peribolus is 180 ft. long and 100 ft. wide, occupied by fifty-eight cells each 10 ft. wide, and surrounded by a double colonnade which forms a sort of vestibule to each cell, agrees in many respects with the plan of a temple built A.D. 1032 by another merchant, Bimul or Vimala Sah, which is given in the *Handbook*, as well as by FERGUSSON, *Pict. Illust.*, fol., London, 1847, p. 39, pl. 9, with a fine illustration: this temple is about 140 ft. by 90 ft., with fifty-five cells, surrounding a vimana and a mantapa of forty-eight pillars. From this illustration confidence can be placed in the assertion of TOD, that "it would be tedious to particularize the varied riches of these shrines; still less would it be desirable to repeat a vague and indistinct outline of the architectural details of the minor temples which surround these glories of Aboo, although each is entitled to notice, and in point of magnitude they surpass those described. That, for instance, which still retains the name of its founder, the merchant Bheena Sah, is totally different in style from the rest, and four stories in height." It must be observed that either TOD or FERGUSSON has substituted the description of one large temple for that of the other; or at least has given the wrong name, date, and dedication, to each account. The writer in fault, however, can only be detected upon the measurement of the mantapa of each temple; the dome being 24 ft. in diameter in one, and 26 ft. in the other.

DAIRA or DEHRA, commonly written *dayr* or *deyr*. The Arabic term adopted throughout Hindostan for a monastery, but chiefly applied in India to a Jain temple.

DAIRY (late Latin *daeria*, *dageria*; Fr. *laiterie*; Ger. *milch-kammer*). The place in which milk is kept: the term is also applied to a shop in which milk is sold; and to a house in which it is turned into butter and cheese. In a dairy farm appropriated (chiefly in Cheshire, Gloucestershire, and Devonshire) to the production of food for cows kept for their milk, if its extent be considerable, the centrality of the site of the farm buildings becomes matter of importance. The milking place should be as near as possible to the dairy, but with an enclosed passage of communication. This passage may have on one side the milk room, and on the other the scalding room, with an outer door to the west or south. A verandah on three sides of the house is useful for protection to the utensils that are daily to be dried on benches in the open air. The churning room for the production of butter; the pressing room with its guttered shelves and floor; and the finishing room, if

there be one, for making cheese, should open out of the scalding room and communicate with the passage just named: the store room, or CHEESE ROOM, may be on an upper floor. As the agitation of milk is to be avoided, as well as the variation of its temperature, the site should be distant from a road used for heavy carriages. The equable warmth from 45° to 60°, or more nearly from 50° to 55°, that is necessary throughout the winter, may be maintained by flues: and the equally desirable coolness at that temperature in summer is obtained either by a stream of water flowing through the room, or by constantly flooding the tile, stone, or slate floor and dressers: in both cases it is essential to establish a current of air to carry off any effluvia; this current is rarely obtained when the milk room is a mere grotto, with a tank in the centre of its floor, though such a place may be very cool in summer. Equable temperature has been sought by sinking the dairy below the natural surface of the ground, to which there are serious objections; or else by building it of hollow walls covered with two or three vaults, or with a mound of earth, or with thick thatch, in short, like an ice-well (an ice-well is, indeed, a desirable addition to a dairy, whether the latter be an object of luxury or of profit). A dresser 24 ins. wide should be placed round three sides of the milk room to hold the pans; from 13 ins. to 15 ins. in length of shelf will suffice for the milk of each cow: and a shelf 18 ins. wide may be contrived under the dresser. Just above the dresser and shelf there are usually wired openings with shutters and sashes, but a good system of ventilation at the floor and roof is preferable. Light is not wanted, but cleanliness is essential; indeed, not even butter should be kept on the shelves usually placed on the fourth or door-side of the milk room, much less cheese or other provisions sometimes put there. The cleanliness of the drain from the milk room should be a matter of special caution, and there ought to be no large trap if the use of water is not so frequent as to keep the liquid in the trap from stagnation: this is the reason of the usual recommendation to choose a declivity for the site of a dairy. Great care should be taken to remove to a distance from the dairy any source of effluvia; and this is said with the recollection that the cowhouse and milking place should be close to the dairy. The entrance to the milk room should be secured, it is said, with double doors, at least 3 ft. apart. The use of glass or earthenware for the shelves and utensils is rapidly superseding the necessity for any observations on the leaden and other troughs used in large dairies.

An ornamental dairy among the offices of a mansion, unless a sort of summer house or other pleasure room be attached to it, is little more useful than a larder kept for show; and like the shop for the sale of milk, etc., requires no further notice than mention of the agreeable effect produced by the use of cement or white tiles on the walls, with ornamental tiles for the floor, etc., stained glass, and other obvious modes of decoration, paint excepted. A show-dairy at Alnwick, and one in a Chinese style in the lake at Woburn abbey, are often praised: a very pretty "laiterie Suisse", etc., at Boulogne near Paris, is given in NORMAND, *Paris Moderne*, 4to., Paris, 1849, iii, 105; the most celebrated are the dairies (It. *cascine*, literally cheese-houses) of the grand duke at Florence. WAISTELL, *Designs*, 4to., London, 1827, p. 27; DEAN, *Essays*, 4to., London, 1849, p. 26; PAPWORTH, *Hints on Ornamental Gardening*, 8vo., London, 1823. 8. 14.

DAIS, DEIS, DES, DESSE, DEYS, sometimes spelt and pronounced *dica*. A word used in its native country, France, for a canopy: thus QUATREMERÉ, *Dict.*, s. v., simply notes that it may be of wood, metal, or other material, suspended or fixed, isolated or engaged, over an altar, a throne, a pulpit, etc., but is technically a canopy of tapestry or woven material: so also VIOLET LE DUC, *Dict.*, s. v. *Chaire*, who gives an illustration of the episcopal throne, dating from the fourteenth century, in the church of S. Severin at Bordeaux; he also explains *chambre du dais* as the name given to the room in which, under a

canopy, a feudal lord held his courts. GUENEBAULT, *Dict.*, s. v. *Dais au pavillon*, gives a long list of illustrations of fine canopies. The exact meaning of the word, as adopted in the English language, has been the subject of some controversy; but, from the expression, "se veint mettre à table sur un hault ders—soubz un grand ders", in GODEFROY, *Ceremonial*, 4to., Paris, 1619, p. 335, the progress may be traced from the original sense, to that of a canopied seat for an eminent personage, of the table in front of such a seat, and finally of the raised floor, the *estrade*, on which the seat and table were placed; this last, from the time of CHAUCER at least, has been the English acceptance of the word. 19.

DAKKEH in Nubia, see PSELGIS.

DALAN or DALLAN. The term applied in Hindostan to a hall, or rather porch; thus *dar-dalan* is an outer hall or ante-chamber, and *pesh-dalan*, a balcony.

DALB and DALBURA, see DAUB.

DALBERGIA. East Indian ebony, blackwood, or rosewood (*sit-sal*). It grows to a very large size on the Malabar coast, and is one of the most valuable woods of the Madras Presidency.

D. LANCEOLARIA (*Neddon*, *Nedun*, *Nanderwood*) is used and valued for house building in Ceylon.

D. LATIFOLIA is a heavy, close grained, greenish black wood, beautifully marked with lighter coloured veins; as it takes a high polish, it is much used for furniture. For engineering purposes it is very valuable, and large forests of it have been formed in waste places in the north-west provinces of Hindostan. It forms a magnificent tree, often supplying planks 4 ft. broad after all the external white wood has been removed. It is also called *lana wood*. 71.

D. SISOIDES, a smaller variety, and more common, also yields a black wood: in Madras both are called 'rosewood'. As this wood contains much oil, it is unfit for the reception of paint.

D. SISOO, Sisoo wood, somewhat resembles the finer sorts of teak, but it is tougher and more elastic. It usually grows in Rohilkund to a height of about 30 ft., but is generally more or less crooked, and therefore not suited for beams, though highly valued by the ship-builders of Bengal. The wood is said to harden with age. It has a light greyish brown colour, with darker coloured veins, and the pores nearly filled with dry resinous matter. Compared with teak its strength is said to be as 1030 to 869. 71.

There are few trees more deserving of attention than the Dalbergia, considering its rapid growth, beauty, and usefulness. The wood is hard, strong, tenacious, and compact; whilst its great durability renders it one of the most valuable timbers known. The tree grows rapidly, is propagated on sand with facility, and early attains a good working condition of timber. It is used in Bengal for gun carriages. *BUILDING NEWS Journal*, ii, 804.

DALLAN or GOLLANE. A term used in Ireland for a monumental memorial or boundary stone.

DALLERA, see LERA (BERNARDO DA).

DALMATIUS (SAINT), bishop of Rhodéz, is recorded as having taken down, rebuilt, and demolished his cathedral church so many times, that he died, about 580, without having brought it to completion. AIMONUS, *De Gestis Fran.*, fol., Paris, 1602, iii, 41; S. GEORGIUS FLORENTIUS GREGORIUS, *Ep. Turon. Hist. Fran.*, 8vo., Paris, 1610, v, 46.

DALTONISM, see CHROMATOLEPSY.

DAM, see ASTYLEN, COPPER DAM, and DESTINA.

DAMAGE, see CONSEQUENTIAL DAMAGE.

DAMARA, see DAMMARA.

DAMARLOUT. A wood of Penang, used for building and general purposes.

DAMASCUS. The capital of the province of the same name in Syria. The city, surrounded by a thick wall, is about two miles in length, but narrow, and full of streets, mostly only a few feet in width, of houses with projecting stories, which although not so lofty as those in most oriental cities, because built of sun-dried bricks, are so numerous that the city has been compared to a large camp of conical tents, represented by the small domed roofs necessary for protecting the buildings from rain in winter. All visitors, however, speak in the highest terms of the interior of such dwellings as they can obtain permission to enter, as well as of the external appearance of the mosques,



many of which have been churches; that formerly dedicated to S. John is said by WELLSTED, *Travels to the City*, 8vo., London, 1840, i, 336, to be ranked locally as only inferior to S. Sophia and the mosque of Omar. The edifice is 320 paces long and 80 paces broad inclusive, it is to be supposed, of a court surrounded on three of its sides by two rows of granite columns of the Corinthian order: the gates are of enormous size, and wholly covered with brass. GIRAULT DE PRANGEY, *Essai*, 8vo., Paris, 1841, p. 3, merely says that in 705 the caliph Walid caused the erection of the great mosque on the site of a Christian church of S. John, and that the first minarets were erected about that period in this city. A portico discovered by Mr. W. R. Hamilton in 1802, consists of six Corinthian columns about 42 ft. in height, the end ones connected with a double pilaster, and the middle intercolumniation broken into an arch; it is described by Sir G. Wilkinson to be of the same class and period as those of Baalbec and Palmyra; CIVIL ENGINEER *Journal*, viii, 263. These appear to be the remains mentioned by WALPOLE, *Travels*, 4to., London, 1820, p. 315.

At Mucksuryeh, distant eight hours hard riding, are the ruins of a temple of the Corinthian order, 60 paces long, 25 paces broad, and 50 ft. high, with fragments of columns and entablatures, sarcophagi, etc., according to WELLSTED, *Travels to the City*, 8vo., London, 1840; PORTER, *Five Years in Damascus*, 8vo., London, 1855, i, 24, minutely describes the ruins in the city, and gives among other illustrations a plan of the great mosque.

**DAMBOOL.** The name of a rock, in Ceylon, which is celebrated for its five Buddhist cave-temples. These are the Mahadeva-devale, now containing a statue of Vishnu in the form of Ramachandra, as well as one, 47 ft. long, of Buddha recumbent: the Passilame (western) and two aluth (new) viharas, are formed on the same plan with, but inferior in size and ornament to, the Maha-raja-vihara, founded by the king Walagambhoo, B.C. 86, which is 172 ft. long, 75 ft. wide, and 21 ft. high near the front, but of less height at the end; the arrangement of the forty-six statues of Buddha, and the general design of the dagoba, is shewn, but badly, in the ILLUSTRATED LONDON NEWS, 1851, xix, 37. Kirti Nissanga, after repairing the damages occasioned by Malabar invaders in A.D. 1193, caused all the statues to be gilt, and so ornamented the fanes of Dambool that it obtained the appellation of 'the golden rock': FORBES, *Eleven Years in Ceylon*, 8vo., London, 1840, i, 367; ASIATIC SOCIETY OF BENGAL *Journal*, 8vo., Calcutta, 1847, xvi, 340.

**DAMESME** or **DAMÈME** (LOUIS EMMANUEL AIMÉ), born 19 April 1757 at Magny, built at Paris several mansions, and in the rue Chantereine the theatre of the Société Olympique; of this last work it is said that Alexander, emperor of Russia, applied for a copy of the drawings. At Brussels he designed the maison de detention or prison civile, in the Petit Sablon, commenced 1813, but suspended till 1815, and finished 1818 under Werry: and built 1817-18 the grand theatre or theatre royal in the place de la Monnaie, at a cost of £64,000; this was burnt 1855. These last works are carefully illustrated in GOETGHEBUER, *Délices*, fol., Ghent, 1819, pp. 13, 30. He died 14 April 1822. The JOURNAL DE PARIS, 23 April 1822, gives other details.

**DAMMARA** or **DAMARA AUSTRALIS**, the KAURI, KAURIE, KAWRIE, KOURIE, COWRIE (corrupted into COWDIE), PINE.

A native of New Zealand, and the most magnificent of the coniferous woods, although not a true pine. It is said to grow from 4 to 12 ft. in diameter; a tree that had been blown down was found to measure upwards of 170 ft. in length. In November 1856 there were imported two spars of this pine, 100 ft. long by 34½ ins. diameter, said to be without a knot. Having a straight clean stem, and being also light and tough, this tree is found well calculated for masts and spars in shipbuilding, for which purpose it yields the largest and strongest spars of any known tree. When cut into strips for the inside moldings of vessels, it is found in this country to expand and buckle very much.

**DAMONICO** or **MONICON**. A rich and durable orange coloured pigment, which is an iron ochre, being composed of terra de siena and Roman ochre burnt, and having all their qualities, especially that of possessing a considerable degree of transparency.

**DAMP.** The damp or moisture which is likely to affect the operations of the architect, may be produced by several distinctly marked causes, each of which has its peculiar mode of exhibition, and requires to be treated in a manner adapted to its characteristic action. Damp will injuriously affect buildings the most seriously, 1, when it arises from the condensation of the moisture contained in the surrounding atmosphere upon the exposed surfaces of building materials; 2, when it arises from the absorption of moisture from the ground about the foundations of a building, or from the capillary action of the building materials; and 3, when it arises from the original composition of those materials themselves.

1. Damp arising from the condensation of atmospheric moisture is of course mainly affected by the amount of the latter; and is consequently most perceptible in those seasons of the year when not only the air contains a large quantity of moisture, but the average degree of temperature is low. On the occasions of a thaw succeeding a long continued frost, or of a change from a continued cold northerly wind to a warm moist southerly one, the building materials which do not rapidly adapt themselves to the changes of temperature, or which are of a non-absorbent character, cause the air in immediate contact with them to deposit the moisture it held in suspension. As a general rule, porous spongy materials are worse conductors of heat than more dense or polished ones; and thence it happens that the amount of atmospheric condensation (or of damp from the first cause) is nearly proportional to the hardness and the brilliancy of the surfaces exposed. Marbles, granites, crystalline limestones, and metals, for instance, are always covered with moisture about the time of thaw; because they so rapidly abstract from the air around them the heat necessary to enable it to hold vapour in suspension, that a precipitation of water almost instantly occurs. The only remedy for this inconvenience would be to raise the temperature of the materials themselves to that of the atmosphere; but as such an operation would in most cases be impossible, it follows that it is preferable to employ non-conducting absorbent materials in positions where the variations of the hygrometric state of the atmosphere are likely to be seriously felt. It is for this reason that it is preferable to line the walls of dwelling rooms with plaster and with paper, rather than to use marble, polished stucco, or even painted surfaces; and it is likewise better to pave internal passages with the porous sandstones, or with slate, than with harder materials susceptible of bearing a polish. By the same rule, a greater amount of damp may be observed upon oil cloths than upon carpets; and upon varnished papers than upon flock papers or upon tapestry hangings.

As there is always more humidity suspended in the atmosphere near large bodies of water, than at drier situations, greater attention is there required in the choice of the building materials to be employed. The evaporation which takes place on the sea shore exercises a more direct and powerful influence than that from large bodies of fresh water, because the humidity which the evaporation from the sea deposits upon solid bodies calculated to condense the watery particles, contains certain salts of a highly hygrometric and deliquescent nature. In fact, building materials which resist the action of the atmosphere in one position, are rapidly destroyed by that action in others; and the conditions of their absorption or of their non-absorption of moisture—in other words, of their actual susceptibility of damp from atmospheric deposition—may be considered as tolerably correct indications of their durability. Those materials which are so open or so porous in their texture as to absorb the moisture deposited upon their exposed surfaces, generally speaking, decay rapidly; but at the

same time they are far from presenting the disagreeable appearance of dampness which characterises the denser materials.

2. The absorption of damp from the ground about the foundations of a building, affects the latter to a height dependent upon the capillary quality of the materials of which it is composed. The minute interstices between the molecules of those materials act, indeed, as capillary tubes, and would often allow what workmen properly call "the ground damp" to rise to an inconvenient height, if precautions be not taken to isolate the porous materials from the ground. It is for this reason advisable in all foundations to employ the densest and the hardest materials in conjunction with the most efficacious hydraulic limes or cements when the building materials are not of large dimensions. At a *small* distance above the ground it is likewise advisable to introduce a layer of an impervious substance, such as two courses of bricks or stones, or as many courses of slates with joints crossed, all bedded in cement or pitch; or better still, a layer of lead or of asphalt extending over the whole surface of the wall; or again, hot lime and sand with coal tar made into mortar for one course; or, boiling coal tar poured on the stone, and as much slaked lime placed on it as the tar will absorb, which is to be left for a few days to harden; but even these precautions will be only partially successful if a free circulation of air be not allowed to take place between the ground and the paved or boarded floor. When, therefore, it is necessary to construct chambers below the natural level of the ground, from which dampness must be excluded, the proper course is to isolate the walls of the chamber from the source of moisture by means of a double wall, so as to leave an open space, or DRY AREA. The outer wall should be built of non-absorbent materials, and rendered towards the ground with a coat of hydraulic cement or of asphalt; it must begin as low as the foundations of the inner wall, and the open space thus isolated should have free communication with the external atmosphere: the paving or floor of the basement chamber should be laid hollow, and an effective circulation of air maintained beneath it, communicating with the dry area; the sleeper walls, and the foundations of the main walls to the same height, should be executed of non-absorbent materials; and when the subsoil is damp it would be advisable also to insert the intercepting layer above mentioned. It follows, that the use of large porous stones is not desirable when those stones are likely to be placed on or near the ground line, because the damp will infallibly permeate them for their whole height; nor will the interposition of one layer of hydraulic mortar suffice always to arrest its ascent. In such cases the decay of the stone will be most perceptible immediately under the bed of mortar, which acts to some extent, though ineffectually, to prevent the damp from rising.

A somewhat similar action to that connected with the absorption of moisture by walls from the ground, takes place when the upper parts of the walls have projections or sets-off of a form to retain rain water; and this action, in a less degree, may be observed when the materials of which those upper parts are composed are sufficiently porous to allow of their retaining and transmitting, by their capillary qualities, the rain which may have beaten upon their exposed faces. It is for this reason that great precautions are required for isolating surfaces intended to receive fresco or other costly decorations from walls directly exposed to the action of the atmosphere; and it is to the neglect of them that the ruin of many noble works of art may be attributed. In some modern cases, as in the panthéon at Paris, a successful attempt was made to render the stone of the cupola sufficiently impermeable to protect the painting subsequently applied; an explanation of this is to be found in the Appendix to the second *Report of the Commissioners on the Fine Arts, 1843*. But the wisest course appears to be, to interpose some impermeable material between the surface intended to receive the decoration and the wall itself. Thus, in the construction of the ministère des affaires étrangères at Paris, in the grand

reception rooms, M. Lacornée isolated the damask silk hangings from the walls by covering the latter with thin sheet lead, and by then battening and canvassing to receive the silk. Tin foil has been used in England, and thin slates very frequently.

3. The damp arising from the composition of the building materials themselves, or from the mode of their application, is of a far less durable or permanent nature than the damp arising from either of the causes before mentioned, simply because it is not susceptible of renewal. The principal precaution to be observed in order to prevent its becoming a source of positive danger, is that it should be allowed to develop itself freely, and to escape without impediment. All stones contain a certain quantity of moisture; all bricks ought to be saturated with water before they are placed in a wall; and all limes and cements require in their preparation a larger dose of water than is absolutely necessary for their crystallization. From the exposed faces, then, of every wall, an amount of moisture must in the beginning be given off, dependent upon the nature of the materials and the mode of their application; and in the cases of the limes, cements, and plasters, it is by no means desirable to hasten the rapidity of the evolution of this damp. In fact all the salts of lime, in assuming their definite states, reject the moisture with which they are in contact beyond that required by their atomic composition. They "throw off water", but they only do so by a very gradual process; and there is a probable danger, in the case of a hurried desiccation, of depriving those materials of their necessary dose of water. So long, however, as this process of evolving the surplus water is going on, there is certain danger, both from the efflorescence of the salts brought to the surface, and from the tendency of wood or other porous materials to absorb the dampness thus created; and it is to be observed, that one of the most favourable conditions for the efflorescence of the salts is precisely the regularity of the evaporation of moisture which prevails in the interior of buildings; or in other words, that the salts are thrown out in the greatest abundance upon the inner surfaces of the walls. Decorative works suffer the most from the action of the damp contained in building materials, and it is on this account that it is advisable to defer their execution till some time after the whole of that damp has been evaporated. An interval of twelve months ought, indeed, to be allowed to elapse between the completion of a building and the final painting and papering. If that delay cannot be permitted, a temporary style of decoration, of a nature not to interfere with the one intended to be finally adopted, should be applied.

From whatever cause, of those above cited, damp may arise, it is essential that the woodwork exposed to it should be in a free current of air; because the fermentation which takes place when wood is surrounded by a damp stagnant atmosphere is the most energetic cause of the decay of that material. The precaution of providing a free current of air equally under a stone floor (as described in the previous part of this article) is, however, recommended solely for the purpose of obviating any inconvenience to the inhabitants of the rooms where such floors may exist; for the decay of the stone itself is rather facilitated than otherwise by the greater evaporation thus produced. In some cases it may even happen that a regular mild damp may be desirable, as in cellars holding wines that require forcing. In such places the more porous materials may be employed, provided only that they are able to transmit the earth-damp without giving passage to any water or springs the ground may contain. ATMOSPHERIC INFLUENCE. BRICKWORK, WATER-PROOF, p. 148. CONDENSATION. DRY AREA. EFFLORESCENCE. PLASTERING.

G. R. B.

It is considered desirable to defer to the article *MOISTURE* the consideration of remedies for the visible effects of damp.

DAMPER, SWIPE, or BASCULE, as it is called in the *BUILDER'S DICTIONARY*, 8vo., London, 1734, is described in that work as "an iron plate placed in some part of the funnel of a chimney, and made exactly to fit the place where it is put, with one or

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two wires fixed to it so as to move it backward and forward at pleasure." In this case it slides through a thin opening in one wall of the funnel, the wires or handle at least extending to the outside. Its purpose is the regulation of the draught by altering the sectional area of the clear opening. In a cylindrical flue it may be circular, and revolve on a diameter continued outward and terminating in a handle, on the principle of the throttle-valve in a steam pipe. It will be seen that the apparatus above described as used for furnaces and close stoves of all kinds, as well as common flues, is essentially the same in principle as the self-regulating air-valve of Arnott, and as the common register stove-grates.

J. W.

DANCE (GEORGE), born 1695, was nominated in 1733, by the corporation of the city of London, to the office of "Clerk of the City Works," and appointed thereto in Dec. 1735. In 1732-3 he designed S. Luke's church, Old-street, City-road; 1736-40, S. Leonard's church, Shoreditch, cost £8,000; 1739-53, the Mansion House or official residence of the Lord Mayor for the time being; the cost was about £42,639, and it has since undergone some alterations; thus the interior court was covered over in 1795, and the Egyptian hall roof lowered and the circular ceiling formed, 1796, by his son; the lofty front attic removed, and the present ball room ceiling formed in 1842, by W. Mountague: WOOLFE and GANDON, *Vit. Brit.*, i, 44-50; BRITTON and PUGIN, *Edifices of London*, ii, 121. In 1740-6 he designed S. Matthew's church, Bethnal Green; and 1741-4, S. Botolph church, Aldgate, cost £5,536: 2: 5; 1745, Surgeons' Hall, Old Bailey, since pulled down; 1749-50, the original corn exchange, Mark-lane; rebuilt 1754 the body of Faversham church, Kent, cost £2,300; 1754, made a design for a stone bridge over the Thames at Blackfriars, estimated to cost £185,950 without the purchase of land; 1760, with Sir R. Taylor, formed the large central arch to old London bridge; and 1764, the west wing of the entrance front and the stone façade of the centre building to Guy's Hospital. The Excise Office in Old Broad-street, pulled down in 1854, is usually attributed both to him and to Gandon, but it was erected about 1769, most probably by — Robinson, of the office of the Board of Works. A plate shewing Dance's design for rebuilding Newgate and Giltspur-street prisons, connecting them by a city gate, is given in the *UNIVERSAL MAGAZINE*, xxxiv, 169, for April 1764: it was also engraved on three sheets. He was succeeded Feb. 1767 in the office of clerk of the city works by his son, who purchased it according to the then usual practice for £200; and died 11 February 1768, aged 73, and was buried in the churchyard of S. Luke, Old-street. Original drawings of the Mansion House and other buildings are in Sir John Soane's Museum. *CIVIL ENGINEER Journal*, x, 270. 14.

DANCE (GEORGE), R.A., born March 20, 1741, fifth son of the above, went to Italy about 1758, gained the gold medal of the Academy of Fine Arts at Parma in 1763, for a public gallery for painting and sculpture (there were twenty-nine competitors), and was admitted a member of the Arcadian College, and of the Academy of S. Luke, both at Rome, in 1764. Returning to England, he designed 1765-7 Allhallows church, London Wall, and in 176½ succeeded his father as clerk of the city works; erected Newgate prison 1770-78, at a cost of upwards of £130,000 (which he repaired after the riots of 1780); the front is 297 ft. long and 50 ft. high (BRITTON and PUGIN, *Buildings of London*, ii, 54); S. Alphage church, London Wall, 1774-7; S. Luke's hospital for lunatics, Old-street, 1782-4, of brick, 493 ft. 5 ins. in length, cost about £40,000; the façade of the Shakespeare Gallery (now the British Institution), Pall Mall, for Mr. Alderman Boydell, 1789; and Giltspur-street computer or prison, 1787-91, pulled down 1855. As surveyor to S. Bartholomew's hospital, Smithfield, he almost rebuilt 1789 the church of S. Bartholomew the Less; 1793, designed a new laboratory and other additions to the hospital; and 1795-6 effected the alterations at the Mansion House as above mentioned. From 1796 he was engaged upon and submitted to a

select committee of the House of Commons on the improvement of the port of London, several important designs, which were engraved in the appendix to the third report ordered to be printed in 1800. They embrace a double bridge, each of six arches and a drawbridge, in the place of old London bridge; the embankment of the Thames; and other manifest improvements.

The south front of the Guildhall, King-street, City, was rearranged by him in 1789, and he designed the elegant council chamber. The new theatre at Bath, 1805; the Royal College of Surgeons, Lincoln's Inn Fields, in association with James Lewis, 1806-13, since nearly rebuilt by Sir Charles Barry, R.A.; Finsbury-square, in 1777, 89-91; the plans for Alfred-place and its terminal crescents, near Bedford-square, 1790-1814; the improvements in Skinner-street, Snow-hill, c. 1790; and Picket-place, Strand, 1790-1815; were the other chief public works designed by Dance, who was also engaged in fitting up Guildhall in 1814, on the occasion of the grand entertainment to the emperor of Russia and other foreign potentates.

Amongst his private works were Wilderness park, Kent, for the marquis of Camden; the Grange, Alresford, Kent, for Lord Ashburton; alterations and additions at Bowood, and the library at Lansdowne house, Berkeley-square, c. 1790, for the marquis of Lansdowne; about 1805, an entrance vestibule at Laxton hall, Northamptonshire, for George Freke Evans, esq., (NEALE, ser. 1, ii); about 1820, Ashburnham-place, at Battle, Sussex, for Lord Ashburnham (NEALE, ser. 2, iv); 1803-4, Stratton park, Hampshire, for Sir Francis Baring, bart., M.P. (NEALE, ser. 1, ii); and 1804-8, Coleorton, Leicestershire, for Sir George Beaumont (NEALE, ser. 1, ii). He died January 14, 1825, aged 84, and is buried in S. Paul's cathedral. Among his pupils were Sir John Soane and William Mountague; the latter succeeded him in the office of the city works in 1816. In 1768 he was constituted one of the original forty members of the Royal Academy of Arts, etc., in London, and in 1798 was made professor of architecture therein, but he did not lecture; he was also a member of the Architects' Club in S. James's-street, of the Royal and Antiquarian Societies, etc. He published two volumes of portraits of eminent persons, fol., 1811-14, after his own drawings which are now deposited in the British Museum; two engraved portraits of him exist after Jackson and Hilton; and a bust by C. Rossi, 1826, is in the possession of the Poynder family. Numerous original drawings of the above buildings are in Sir John Soane's Museum, many by his own hand showing great artistic powers, Memoir by S. ANGELL, read at the Royal Inst. of Brit. Archts., and given in the *BUILDER Journal*, v, 333; *CIVIL ENGINEER Journal*, x, 378; *GENTLEMAN'S MAGAZINE*, February 1825.

DANCKAERTS or DANCKERTSZ (CORNELIS), son of Cornelis Danckaerts, also an architect and sculptor of Amsterdam, was born in 1561, and was *bouwmeester*, assistant architect, or perhaps master builder, to the city from 1595 until his death in 1630; MILIZIA erroneously gives 1634 for the latter, besides the credit of several edifices erected under his superintendence, but designed by Hendrick de KEYSER, after whose death in 1621 Danckaerts perhaps finished the West church, and its tower. Under his name appeared *Architectura Moderna*, fol., Amst., 1631, with 44 plates of buildings at Amsterdam and elsewhere; a translation of Scamozzi's work is also assigned to him. MILIZIA, without citing any authority, but probably derived from FONTENAY, *Dict. des Artistes*, 8vo., Paris, 1777, states that he invented a method of building stone bridges without interrupting the course of the water; and that it was tried over the river Amstel, where 200 ft. wide, with perfect success. A portrait after Pietro Danckerts has been engraved by Lode.

3. 24.

DANCKERTS (JUSTUS) flourished at Amsterdam towards the beginning of the eighteenth century. He was coadjutor with Jacob Poley. He published a good work on the construction of roofs and of steeples; in the preface to which he speaks

of his ancestors, 'who were also architects', referring probably to those mentioned in the previous article. The *Architectura Mechanica—Moolle Boek*, fol., Amsterdam, n. d., containing the construction of a windmill, roofs, etc., is probably the work which is meant.

**DANZIG.** The capital of the province of West Prussia. The town itself, nearly circular in plan, ranks in the first class of fortresses. The citadel; four gates, especially the *hohe-thor* 1588, with a side gate 1612; the government offices; the *rath-haus*, of the fifteenth century, but sometimes dated 1379, the slim tower added 1556, with a portal and steps by Eggert, 1768; the *junkers-* (merchants) or *artus-hof* behind it, 1480-1552, remarkable for its great hall, now the exchange, with a vault carried on four slight granite piers; the old *zeug-haus*, 1600; the bank, about 1700; the observatory; the theatre; two synagogues; three monasteries; a nunnery; three public schools; seven hospitals for the sick; three asylums; with the poorhouse and the workhouse, make up the list of public works except the churches. **PASSAVANT**, in the *Kunstblatt*, 32-4, of the *MORGENBLATT* for 1847, has described particular features of some of these works, and of the ecclesiastical edifices: **RANISCH**, *Beschreibung aller Kirchengebäude*, 4to., Danzig, 1695, engraved plans and views of all the churches then existing, in order to give illustrations of the peculiarities of their vaulting. It may be observed that no city has been the subject of more various statements as to dates than Danzig; **MERTENS**, *Baukunst*, fol., Berlin, 1850, has chiefly given the following periods: S. Catherine, 1430; the Trinity or Franciscan church, 1431-1514; S. John, 1460-65; S. Anne, 1480-90; S. Barbara, 1499; S. Bartholomew, 1500; the Greyfriars, 1503; S. Bridget, 1513; and S. Peter, 1515. **MÖLLER**, *Denkmäler*, fol., Darmstadt, 1847, pl. 62-4, has given the stalls in the Greyfriars, and one of the numerous old mansions which bestow a peculiar character upon the city. **HIRSCH**, *Die Oberpfarrkirche*, 8vo., Danzig, 1843, has illustrated, with a careful history, the *dom* dedicated to the Virgin, commenced 1343, but chiefly dating 1400-1502. This structure, 360 ft. long, 142 ft. wide, and 98 ft. high in its star-vaulted roof carried on twenty-six slender octagonal brick piers, consists of equally long and high nave and aisles with square ends; of three aisled transepts except at the north-east; and of fifty cross vaulted chapels between the buttresses. Its records have preserved the names of the builders, Meister Steffens, 1440; Michael, 1484; Hans Brand, 1485; and the city mason Heinrich Hetzel, who closed the works 1498-1502. **SCHULZ**, *Danzig*, etc., 1846. The Cistercian monastery (1178) called Oliva, a short distance from the town, has been published by **HIRSCH**, *Das Kloster*, 8vo., Danzig, 1850.

DANZIG is now more commonly written Dantzie.

**DANZIG DECK PLANK.** A timber formerly imported only for decks of vessels, but now much used for yellow stuff about houses. It comes over in planks from 30 to 40 feet long, 3 ins. thick, and sometimes 13 ins. at the wide end. The upper end is knotty, but makes very good joists, quarters, etc. The butts are generally clean and make excellent wide stuff without glue joints as winders of stairs, wide shelves, etc.

**DANZIG FIR TIMBER.** Danzig fir, Riga fir, and Prussian deal, is said to be obtained from the *PINUS sylvestris*; Danzig deal, Spruce fir, and Spruce, from the *ABIES excelsa*.

"Whenever squared fir timber of great length and size, coupled with durability, is required, Dantzie timber is to be employed. On the average, this timber is the longest and largest fir timber that comes here from any port in the Baltic. It may be procured upon order as much as 70 ft. long and 16 ins. square, being usually 14 or 15 ins. square. The cheaper sort of brack timber has the defect of being full of large knots; the best middling is knotty in a moderate degree; but the crown Polish-squared Dantzie timber, that has been squared in the province where it was felled, may be considered upon the whole the very best timber that the north of Europe supplies;

next to that of Riga, it is the most durable of fir timber. The timber from Pillau, Königsberg, and Stettin, resembles that of Dantzie, but is rather coarser in the grain and more knotty; that of Stettin, though not very long, is sometimes as much as 20 ins. square"; **BAILEY**, paper read at Inst. of Brit. Arch., given in the *CIVIL ENGINEER Journal*, vi, 405. Some experiments on beams of this timber, 28 ft. long, are given in the *BUILDER Journal*, xv, 25, and 209.

It should be noticed, however, that there is considerable difficulty in getting timber in London 42 feet long, 12 ins. by 14 ins., if any quantity is required; whilst smaller scantlings, as 12 ins. by 7 ins., or 7 ins. by 9 ins., if over 50 ft. long, are equally rare, sometimes indeed unattainable.

**DANZIG OAK.** At Danzig as well as at Petersburg, Riga, and several other Baltic ports, there are sworn inspectors and classifiers (*brackers*) of certain articles intended for exportation. Staves and timber of all sorts, *except pine*, are subjected to the brack. Prime quality is branded Krohn, or crown; second, Brack; third, Bracks brack. Crown oak plank is marked C in the middle; brack, B in the middle and end; blacks brack, BB. To distinguish  $1\frac{1}{2}$  from 2, and  $2\frac{1}{2}$  from 3, the  $1\frac{1}{2}$  are marked with 1, and  $2\frac{1}{2}$  with 2. At the end, in rough strokes with paint, crown has, red 111; brack, yellow 1; bracks brack, white 11. **MACCULLOCH**, *Dict. of Commerce*, 8vo., London, 1856, s. v. DANTZIG.

**DAPHNIS** of Miletus, about B.C. 376, in conjunction with PÆONIUS of Ephesus, built near Miletus, according to **VITRUVIUS**, vii, pref., the temple to Apollo, which is usually supposed to be the temple, of an Ionic order, known as that to Apollo Didymæus, illustrated by the *SOCIETY OF DILETTANTI*, *Ionian Antiquities*, fol., London, 1769, i, 27.

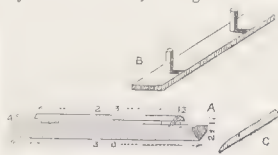
**DAR.** The term used throughout India for a door or gate, especially the entrance to a house, etc. **ADUAR.**

**DARBY.** A tool used by plasterers in floating ceilings. It is a flat board, as B, usually from 3 ft. to 3 ft. 6 ins. in length by 7 ins. in width, having two stout handles by which it can

be firmly grasped. When longer it is called a 'float rule', but properly 'screed float' or 'double hand float'. This is much superseded by the ordinary 'floating rule', which is used *edge-wise* on ceilings as it is

on walls. The name has also been given to a tool, A, formerly used in floating the internal perpendicular angles of rooms. Where still employed it is formed of a triangular shaped piece of wood about 3 ft. long; others are made from 5 to 8 ft. long, and used by two men, one on the scaffold and one below. This shape is somewhat out of vogue, being liable to wear unequally. The feathered board, C, now used for this latter purpose is called the 'feather edge float' or the 'goose'. The 'quirk float' is much smaller than A, and of a more acute angle. **FLOAT.** A. A. J. M. L.

**DARLEY DALE STONE.** This stone is one of the upper members of the great carboniferous deposit of the north-east of England; it is raised in the valley of the same name, near Bakewell in Derbyshire. The rock from which it is obtained is of a very uniform character for a considerable thickness, and is remarkably free from bedding or cross joints; so that blocks of almost any dimensions may be procured. In colour it is very similar to that of the Leeds or of other Yorkshire sandstone, being a light ferruginous, or a light greenish brown. Its mineralogical composition is also similar; being described in the *COMMISSIONERS' REPORT* on the selection of stone for the New Houses of Parliament, as consisting "of quartz grains of moderate size, and of a decomposed felspar, with an argillo-calcareous cement, ferruginous spots, and plates of mica." The specific gravity, when dried, is 2.628; and the weight of one foot cube of the stone in its ordinary state is 127 lbs. 8 oz. It would appear also that the weight producing first fracture was 6,253





lbs. on the superficial inch; but the experiments of the Commissioners were of little practical value.

This stone, first introduced in Birmingham at the grammar school, was used at the railway offices in Curzon-street; also at S. George's hall, and the borough bank in Liverpool; in the staircase at the Gresham chambers, Old Broad-street, London, and at Mr. Beaufoy's schools, Lambeth; for the margins of the fountains in the Crystal Palace grounds at Sydenham; the bridge at Evesham; the portico and cornice of the town hall at Leeds, etc. The present proprietor of the quarries has, however, resolved no longer to work them; and therefore this stone is in fact withdrawn from the market. This is much to be regretted; for, both on account of its colour and of its mechanical properties, the Darley Dale stone is one of the most valuable of the geological series to which it belongs. C. R. B.

**DARMSTADT.** The capital of the grand duchy of Hesse-Darmstadt. It is a small walled city with six gates, containing an old and a new town, the latter only partially occupied, has the finest of the public squares, the Ludwigsplatz, in the centre of which is a Doric column 134 ft. high, bearing a statue of duke Louis I. Among the tall and handsome houses forming the *platz* is the *residenz*, built at the commencement of the present century; the old palace having become the residence of the hereditary grand duke. The chief other buildings are the estates' house, sometimes used as a casino, with a fine semi-circular hall; the *exerzier-haus* or drill house, now used as an arsenal, about 500 ft. long, 150 ft. wide, and 90 ft. high, in one span as illustrated in RONDELET, *L'Art de Bâtir*, fol., Paris, 1832, pl. 112, other accounts say 319 ft. long; the barracks and hospital; and the old market-place with the *rath-haus*, 1580. The Protestant church, in a late Pointed style, has the chancel disused; the nave is lofty, as are the very wide aisles, roofed in three gables at right angles to the length of the church. The Roman Catholic church, by G. Moller, built of brick, in the form of a rotunda, has the interior 173 ft. in diameter and 123 ft. high, with twenty-eight pillars 50 ft. high, and has square projections at the east and west; no windows are seen, as the light is entirely derived from the roof which externally is a low dome; the effect of the arrangement is not satisfactory to all visitors. Two other churches, a synagogue, three hospitals, and eight large with fourteen smaller schools, deserve little notice. MOLLER, *Entwürfe*, has given the theatre, 1819, his church, and the cavalry barrack by Heger. 14. 28. 50.

**DARNAUDIN** ( . . . ) was elected 1791 a member of the Academy of Architecture at Paris. 45.

**DART**, also called **TONGUE** (Fr. *dard*). The ornament, resembling the barbed head of an arrow, which is used as a division between the chief ornaments of an enriched molding or fascia. EGG AND TONGUE. 5.

**DASA** (or properly *das*, *dashi*, or *dasi*), the ravel or unwoven warp at the end of a piece of cloth. The name given in India, as well as *jhalur* 'fringe', to plinth ornaments and string-courses, of which three plates are given under this title in KIRROE, *Illustrations*, fol., Calcutta, 1838.

**DASHI**, see **DAUB**.

**DASHOOR** (the ancient *Acanthus*). The name of a town in the vicinity of Memphis in Egypt. It is only noticeable on account of five pyramids near the neighbouring village of Men-sheeh. The most northern of these is of brick, formerly cased with stone, and preceded by an attached portico or temple, the only instance of this arrangement (hitherto?) discovered in lower Egypt; this pyramid, 350 ft. square and 215 ft., but now only 80 ft., high, is assumed to date before the period of the sixteenth dynasty. The most northern mass of masonry was about 720 ft. square and 342 ft., now 326 ft., high. The southern pyramid, of stone, 616 ft. square and 335 ft., now 319 ft., high, and remarkable because the upper portion was finished at an angle with the horizon different from that of the lower part, is supposed to belong to the period of the eighteenth dynasty. At 180 ft. distance is another stone pyramid, 180 ft. square and

106 ft. high. The last brick pyramid, 342 ft. square, was 267 ft. high, but is now 156 ft. These are partly noticed in the *Description de l'Egypte* (Antiquités), v, 4; and are illustrated by VYSE, *Operations*, 8vo., London, 1842, iii, 56-77.

**DATTARO** (FRANCISCO), called Piccifuogo or Pizzafuogo, erected at Cremona the chapels of the Sacrament and of Sta. Maria del Popolo, 1569; designed the monument executed by G. B. Cambio, in memory of the cardinal Sfondrato; and restored 1575 the *palazzo pubblico*, adding the two great marble doorways: he died 1580, or at least before 1585. His brother, or son, Giuseppe, also an architect, died 22 February 1619: both are highly praised by CAMPO, *Cremona*, 4to., Milan, 1645, p. 198. 57. 68.

**DAUB**, in old English writers **DALB** and **DAWB** (late Latin, *dalbura*, *daubatura* and *dealbacio*), now also called **DAB** and **DASH**. This is evidently a form of the Latin word *dealbare*, corrupted to *daubare*, meaning to whitewash, but it has been applied also to plastering, as is evident from "dealbetur et calce lavetur", so late as 1630, Reg. D., p. 112, of the cathedral, given in JONES and FREEMAN, *History of S. David's*, 4to., London, 1856, p. 171: and the term was used not only, like dash or roughcast, for plastering with lime and sand, but for daubing or covering wattled work with clay by throwing the material (previously well beaten and incorporated together) with great force against the twisted sticks; the **SURTEES SOCIETY**, *Finchale Priory*, 8vo., Newcastle, 1837, Gloss. s. v., mentions "wattles (virge) and dalbving stours for four chimneys, i. e. the framework for clay chimneys, some of which may still be seen in old houses"; and cites the *Promptuarium Parvulorum* for "a dawber or clayman, *tutor*, *argillarius bituminarius*." **COB WALL**; **CONGRATITUS PARIES**; **RAD AND DAB**; **WATTLE AND DAB**. A. A.

**DAUBER'S BEATER**. A sort of club used to beat up and incorporate the materials for daubed walls. Sometimes a large hoe is employed, like that used by temperers in brick-making. A. A.

**DAUCOUR** ( . . . ) was admitted 1680 a member of the Academy of Architecture at Paris. 45.

**DAUPYAN**. A wood of Tavoy, East Indies, used for building purposes. 71.

**DAUTHE** (JOHANN FREDRICH KARL), sometimes **DAUTE**, born 1749 at Grosschocher, near Leipzig. After some practice in engraving, he built as architect the *concertsaal* in the old public library at Leipzig: in 1774 he became member of the academy there, was subsequently *baudirektor*, and died 1816 at Flinsberg in Prussia. 68.

**DAVI** (JEAN) is mentioned in the **CHRONICON TRIPLEX**, etc., in the public library at Rouen as a citizen of that town, erecting at the end of December 1278 the reservoir of the fountain of the cathedral, "Johanne Davi magistro operis tunc temporis." He also designed and executed the north doorway of the cathedral under archbishop Guillaume de Flavacourt, according to DEVILLE, *Revue*, 8vo., Rouen, 1848, p. 18, who is also inclined to ascribe to him the Lady chapel.

**DAVIDO** (MARCO) designed 1765 the church of Sta. Lucia della Chiaivica at Rome. 12.

**DAVID'S (SAINT)**, in late Latin, *Menevia*. A city, formerly the seat of an archbishopric, in the county of Pembroke in South Wales. NORRIS, *Arch. Antiq.*, fol., London, 1810, shows that the town (which ought to surround the cathedral) is represented by a mere village; and he also gives a series of views of the remains, viz. the porth y tower, or east gate of the cathedral precincts, a gateway dividing an octagonal turret 60 ft. high from a circular one, with apartments between them; S. Mary's college, 1360-80; and the old episcopal palace, 1328, almost unsurpassed in England, all in ruins, besides the cathedral. The palace surrounded a courtyard 120 ft. square, but there only remain the south-west side, with a room about 90 ft. long and 30 ft. wide, erroneously called king John's hall, and the south-east wing, exhibiting a hall about 60 ft. long and

24 ft. wide, the very curious kitchen, 36 ft. long, with a low central pillar from which sprang four groin vaults gradually formed into throats of as many flues. The arcaded parapet, equally interesting, is also seen at Swansea castle, the patrimonial property of bishop Gower (1328-47), and at Lamphey court, a palace belonging to the see. NORRIS notices in the cathedral the gentle but perceptible ascent to the choir, and a regular diminution, amounting to about one foot, in the shaft of every pillar of the cathedral built, or rebuilt, 1176, and described by JONES and FREEMAN, *History*, 4to., London, 1856, who give a plan showing the dates of the various portions of the edifice, viz. after the fall of the tower in November 1220, all east of the nave was rebuilt 1220-48; S. Nicholas chapel and the vestibule of the Lady chapel after the earthquake 1248; the Lady chapel 1290; the external face of the choir and south wall of nave 1328-47; the end of the Lady chapel and the exterior of the porch to the south aisle of nave 1461-1522; and the roof of Holy Trinity or bishop Vaughan's chapel 1509. The west front was the work of Nash before 1810. These writers also give the following dimensions: length of nave 127 ft. 4 ins., height 45 ft. 8 ins., width to centre of piers 33 ft., aisles to centre 18 ft. 3 ins.; length of transepts 44 ft. 6 ins., and 27 ft. 3 ins. wide; lantern 27 ft. wide inside, and height 67 ft. 3 ins.; length of choir 53 ft. 6 ins., by 30 ft. 3 ins. wide; north aisle 15 ft.; south aisle 16 ft.; height of the whole tower externally from the level of porch door 116 ft.; total external length 306 ft. Views of the cathedral, etc., are also given in MANBY, *History*, 8vo., London, 1801; *Wales Illustrated*, 4to., London, 1830; and WINKLE, *Cathedral Churches*, 4to., London, 1842, iii, 129. The very singular, if not unique, roof to the nave of the cathedral (late Third Pointed work) is said by nearly all these writers to be of Irish oak. The present episcopal residence is at Abergwilly, near Caermarthen, in a palace rebuilt 1803-25 by Foster of Bristol.

DAVILA (EL CAPITAN MELCHOR), besides the erection of several forts, directed that of the new cathedral at Mexico; and, while superintending the repairs of the old one, was killed by a fall from a scaffold. His nephew and successor Rodrigo was engaged 1586 upon the new cathedral. 66.

D'AVILER, see AVILER (AUGUSTIN CHARLES D').

DAVY DE CHAVIGNÉ (FRANÇOIS ANTOINE), born 4 May 1747 at Paris, published in 8vo., various *projets*, e.g. *Bibliothèque de Jurisprudence*, 1775; *Fontaines des Muses*, 1778; *Pont Triumphant*, 1781; *Monument de la Bastille*, 1789; and *Colonne de l'Empire*, 1806; a *Mémoire sur la Construction des Ponts en Fer*, 1800-1, with plans, etc., of an iron bridge of one arch 182 ft. span (? Sunderland; or Dodd's design for London bridge); and a Report on Viel's work, *De la Solidité des Bâtimens*. He died 17 August 1806; and VIEL published a *Notice*, 4to., Paris, 1807.

DAWB, see DAUB.

DAX, also called Acqs. A square fortified city in the department of Landes in France. It retains traces of its Roman and English occupants, in the straight and wide streets lined with tolerably good houses. The church, dedicated to the Virgin, was made cathedral 1025-55; it began to collapse 1623-38, and was nearly in ruins 1639-58, at which time it was restored. The stained glass, if any still remains, chiefly dates 1497. In the vicinity of the town is the stone pulpit of S. Vincent, belonging to the church previously the cathedral. The see was abolished 1801, and the episcopal palace is occupied by the prefecture and municipality. The canons' houses were destroyed 1519-55, and immediately rebuilt. The fort; an interesting church; the remains of the monastic buildings; and the old bridge, at a great height above the bed of the Adour, are the only other architectural features. 74.

DAY. The mediæval term for each perpendicular division or light (Fr. *jour*) of a mullioned window, as appears in the Will of Henry VI, with reference to the building of King's College chapel, Cambridge.

ARCH. PUB. SOC.

DAY. A length of time engaged in work, and thus charged by workmen to a builder, and by him to the employer. The day is generally considered to consist of ten hours, from 6 A.M. to 6 P.M., allowing at 8 o'clock half an hour for breakfast, at 12 an hour for dinner, and at 4 half an hour for tea. Workmen are not expected to assemble at 6 A.M. whatever the weather may be, if their operations are likely to be prevented by rain; they decide for themselves, as it is their loss, whether the rain evidently will be too powerful for them: but if the rain is slight and likely to cease, they are allowed to 'knock on' at any of the above times, and, by repeatedly attempting to do something, establish their claim for payment by the master until he 'knocks off'.

A. A.

DAY LIGHT. The period during which workmen can see to carry on out-door work. Among navvies a curious rule prevails; they say, when two stars may be seen with one eye it is time to leave off work.

A. A.

DAY WORK. Work paid for by time, and not by the piece. This is generally much better done than by the latter method, as more thought and care is usually given to its execution, as there is no inducement to hurry it over. PIECE-WORK.

A. A.

DAY'S WORK. The quantity of work which an ordinary mechanic can perform within the customary hours of labour of the day. This should be as much as a workman can manage without wasting his time, and also without unduly taxing his powers. As may naturally be expected, there is always much difference of opinion between masters and workmen on this subject. The strength and dexterity of men differ much, and as much cannot be expected from one as from another: on the other hand, where there is no personal inducement to dispatch, men are apt to fall into careless or lounging habits. The test is generally made by letting a certain quantity of work at a fixed price, and, by calculating the time this TASK WORK or PIECE WORK takes, a scale is formed for what is considered fair to expect to be done as day work. As personal interest is a great spur to exertion, it is supposed a man will task his abilities more severely by the latter scale than by day work, and the calculation is made accordingly. In some shops it is considered that if a man earns 5s. a day by time, work should be so let to him as to enable him to earn 5s. 6d. or 5s. 9d. by the piece. GWILT, *Encyc.*, has endeavoured to give constants for the value of all kinds of work calculated at the usual rate of working. As, however, the effective value of a day's work must depend upon the local facilities for the execution of the labour under consideration (in the way of tools, machinery, etc.), it is almost impossible to define the exact value in question. Some careful observations have been made by French engineers upon the average results of workmen's labour in the more elementary classes of building operations; GENIEYS, *Recueil de Tables*, 8vo., Paris, 1835; CLAUDEL, *Formules à l'usage des Ingénieurs*, 8vo., Paris, 1854. It must be distinctly understood, that their results are of limited application in places wherein mechanical appliances are generally adopted, and of course that the money-value of the day's work must depend upon the state of the labour market at the precise period under consideration.

DEAD COLOUR. Colour so mixed as to have no gloss when laid on. This is generally effected by the use of less oil and more turpentine than in ordinary paint. Strictly speaking, it is the coat intended to receive the *flattening*, and by some is called a "half-flattening" coat. FLATTING.

A. A.

DEAD FLUE. The upper part of a flue of which the fireplace is blocked up. As this produces a kind of 'pocket', accidental communication with an adjoining flue, or a pipe from a stove laid into it, has often led to damage by soot depositing and catching fire.

DEAD HOUSE (Fr. *morgue*; Ger. *leichen-haus*). Besides the BONE-HOUSE and the CHARNEL-HOUSE, two other places are used for the reception of corpses upon the Continent; one a species of chapel, like that in the cemetery at Munich, in which



the deceased of each day lie in open coffins, with their names attached, to be viewed through glass doors; and the other a receiving house under the care of the police, such as the *morgue* at Paris: two examples of this class, one at Türkheim and the other at Speier, given in the *BAUZEITUNG Journal*, 1846, pl. 53, p. 240, were erected not only for the exhibition (as for the purpose of recognizing unknown persons found dead) of corpses; but to prevent burial before true death is ascertained; and to guard the health of the poor, who would sometimes be obliged to occupy the room that contained the corpses of their relations. No establishment of this kind has yet been constructed in England; the nearest approach to it, besides the outhouse of a workhouse, is the receiving house of the Royal Humane Society, such as is described in the *ILLUSTRATED LONDON NEWS*, 1844, v, 144, which would be a *morgue* if it were enlarged by the addition of chambers for the corpses with air-tight windows, on one side to the warder's or watchman's room, and on the other to the public passage for inspection by parties concerned.

**DEAD SHORE.** In repairing walls, particularly in underpinning, the perpendicular shores are sometimes left and the brickwork is carried up round them, in order not to endanger the superincumbent work by their removal: in this case they are called *dead shores*, or *growing shores*. **SHORING.** A. A.

Such shores, almost wasted to powder, were lately found in great number in the north wall, of late Perpendicular date, to the church at Staplehurst, Kent. T. H. L.

**DEAFENING,** see **SOUND BOARDING.**

**DEAL** (Ger. *diele*; Dutch, *deele*; Danish, *dæl*, 'a board,' or rather 'a floor-board,' and supposed to represent the Anglo-Saxon *dæl*, 'a portion' *sc.* of a tree). The name given to fir and pine in the state ready for joiners' work, the word being used in contradistinction to 'timber,' the term for the same wood as used by the carpenter. Of this stuff there are three divisions, *battens* up to 7 ins. in width, *deals* up to 9 ins. in width, and *planks* above that size, but usually 11 ins. in width. The following article will treat of deal in this restricted sense, which by the custom of trade does not exceed 3½ for 3 ins. in thickness, and of any length procurable above 6 ft., a shorter length being called a *deal end*: until 1821, 8 ft. was the shortest length. The only other distinction was that of *thickness*, 1½ in. stuff being called 'whole deal,' or 'single deal,' and 2 ins. 'double deal': for deals 3 ins. thick were cut into *boards* or *leaves*; the thickness divided by one cut gave *whole deals*; by three cuts, *slit deals*; and by four cuts, *five-cut stuff*; but these terms appear to be nearly obsolete. Although at present, by the 9 and 10 Vict. c. 23, deals pay duties on the load of 50 cubic feet, a custom has commenced of selling deals at the long hundred of six score or a hundred and twenty pieces, each 12 ft. by 9 ins. by 3 ins.; in fact at per 270 cubic feet. This length of twelve feet is said to be the usual dimension obtained from a tree of seventy or eighty years growth, cut into three lengths.

The popular distinction of red (or yellow) and white fir or deal, and red, yellow, and white spruce (or pitch) pine and larch, arises from the depth of tint given by the resinous matter contained in the wood, which has been considered to indicate the durability of the deal; so that yellow and white are popularly regarded as first and second class deals. In trade a further distinction is made by mentioning the countries or ports from which deals are imported; but this nomenclature is noticed *s. v.* **TIMBER.**

The term 'red deals' is rather provincial, since such deals (as those from Riga) are called yellow deals in London. Red or yellow deals from the European ports are probably obtained from the *pinus sylvestris*. The best American yellow pine deals are said to be procured from the *pinus resinosa* or *rubra*, the *pinus mitis*, and *australis* or *palustris*. The white deals appear to be derived from the *abies excelsa*, and perhaps also *picca*; while the American white deals are chiefly obtained from *abies canadensis*, *nigra*, and *alba*, and *pinus strobus*. It must be

confessed that the want of positive information as to the species which furnish this useful material is not creditable to the present state of science. The only points, indeed, which have been ascertained with any certainty are the general qualities of the deals uniformly exported from certain localities: other harbours may at times transmit cargoes obtained wholly or in part from similar species and of equal quality, but the cargo passes for the usual description furnished by the particular place of shipment. Such definite information in addition to the above as could be obtained, has been placed under the respective heads of **ABIES**; **BALTIC TIMBER**; **BATTEN**; **CANADIAN TIMBER**; **PINUS**; **PLANK**, etc.

The following account is abstracted from the *Report* of the Select Committee on Timber Duties, 1835, p. 363. Many red wood, or yellow, deals fit for rough out-of-door purposes and coarse floors are wholly inapplicable to fine joiners' work, as they warp and twist: such deals are termed 'strong', and in drying they rend and become shaky. Such as do not form sawdust, but are torn into long fibres by the saw, are termed 'stringy deals', and are generally of this strong nature. These are heavier than the better sort, which present a silky texture when planed. The deal should be straight in the grain, without coarse knots, and the cleaner the better. The resinous matter, if left in the board, causes it to rend on drying, and in yellow deals the sap ought only to show itself at the edge farthest from the centre of the tree.

**Norwegian deals.** The white and yellow deals from Christiania are the best, being the most durable and mellow: they were formerly assorted into *best* and *second* deals.

The yellow from Friedrichstadt are nearly as good; in the white, however, the bark of the tree surrounds the knots like a black ring, and the knot falls out when the deal is cut thin. Other deals, but of inferior quality, are imported from neighbouring ports.

**Swedish yellow deals.** Those from Stockholm and Gefle are nearest to Christiania, but are disposed to warp, and the knots of Gefle deals are coarse. Those from Gottenburg are rigid and unfit for the joiner's purposes.

**Russian and other deals.** The yellow deals from Archangel and Onega alike approach those of Christiania, being exceedingly mellow and fit for the joiner, but not durable or capable of resisting the damp; they therefore should not be used in the ground floor of a house. The knots are apt to be surrounded by dead bark. Petersburg and Narva yellow deals are inferior, not so mellow as those from Archangel and Onega, and as nearly liable to the dry rot as the yellow pine of America. Yellow deals from Memel and Dantzic are very durable. They are employed for all rough purposes out of doors; for barn floors and for steps of stairs when clean. The yellow deals of Finland resemble the coarser varieties of Sweden.

The above remarks equally apply to the white deals, except that the sapwood in the latter is not discernible from the heart. Those from Christiania are the very best, being light and mellow. Those from Friedrichstadt have small black knots; from the other ports they are of less width. The lowland white Norway deals warp and split on drying. Both good and bad were sent from Dram; those from Moss were bad; Gottenburg are stringy, and generally used for packing cases. The white from Archangel, chiefly imported by accident, are good. Narva supplies those next best to Norway, and Riga follows third in quality. The Petersburg deals shrink and swell with the weather even after being painted.

American yellow pine of the best quality is shipped from the river St. Lawrence; the best are those from the *rivière du Loup* in Canada. It is of a light and spongy texture, suitable for all internal fittings of houses, being free from knots, and therefore easily worked; and preserves the form given to it without warping. If exposed to damp in a confined place it decays rapidly; but in the open air, although exposed to an alternately wet and dry atmosphere, it stands well.

Red pine deals answer for the same purposes to which the yellow or Scotch fir of Europe is applied.

The white spruce deals are not to be compared to those of Europe, being liable to warp and the knots to fall out. They are used only for floors of the most ordinary houses. The hemlock spruce is too bad in quality to be used for any other purpose than packing cases.

Although there has always been a prejudice against American deals, all deals sent to Quebec are subject to the examination of regularly appointed inspectors who arrange the different qualities. The Georgia pitch pine is celebrated for its freedom from the attacks of the white ant; and it is said that although the European white deal from the Norway spruce fir and the wild pine are liable to the attacks of a beetle, the *Bos-trichus piniperda*, the American is exempt from it. It is doubtful whether on the contrary the American is not more a favourite with the deathwatch, *Anobium striatum* and *tessellatum*, than the European pine; and all authors ascribe the universality in England of what is termed *dry rot*, to the long stowage of American deals while 'green', during their passage from one port to another.

Deal from Wyborg, now very much used as being the best joiners' deals in the market, is a very fine deal, but a little inclined to sap. Gottenburg deals, though very strong and durable, are considered bad by the joiner.

A similar prepossession exists in favour of certain denominations of deals for particular purposes; thus it has always been recommended that Norway deals, particularly Christiania battens, should be used for framing, Swedish deals not being so proper because liable to warp; Christiania white deals and American yellow pine for panelling; Stockholm and Gefle yellow for ground floors; Dram and Christiania white for upper floors; Archangel and Onega planks for warehouse floors and staircases; Petersburg, Onega, and Christiania battens for best floors. It has been stated that American deals are too soft for floors; for interior finishings generally the Baltic yellow and white deals, with the American and yellow pine are universally employed in this country; and latterly a decided preference has been given to the soft, tough, yellow fir from the colonies for all indoor work, wainscoting, and fittings, in short almost every thing except the solid timber of buildings. A white pine of America is largely used for moldings, etc., being light, soft, clean, and straight grained, but it is liable to dry rot.

Deals are chiefly cut abroad out of the log, because they thereby obtain a year's seasoning; give less freight of waste timber; and have not the shakiness found in those which are not made until after the arrival of the timber in this country. The first class of deal is certainly that which is 3 ins. thick, but such are rarely obtained clear of sap; a good deal ought to run 9 ins. within the sapwood, which is not the case with five in every hundred at present, for though some may have more than 9 ins., others only show 8 ins. of good wood; 2½ in. deals are those generally ordered by importers, because that thickness will make 1½ in. flooring, etc., boards; 2 in. deals are chiefly used for the floors of concert rooms, stages to theatres, etc.; the worst kind, not good enough to be exported as deals, is mere fire-wood.

The introduction of deal and fir timber into use in England was the subject of a paper read at the Royal Inst. of Brit. Architects, Nov. 2, 1857, by W. PAPWORTH, and reprinted in the *BUILDER* and *CIVIL ENGINEER Journals*.

DEALBACIO, DEALBARE, see DAUB.

DEAMBULACRUM, DEAMBULATIO, DEAMBULATORIUM. The late Latin terms for a passage, according to the curious extract given under the first of these terms by DUCANGE, *Gloss*. They are susceptible of more precise explanations according to other words which accompany them, as *claustrorum*, *ecclesiarum*, *stercorum*, etc., viz. the walk of a cloister, of a church

ARCH. PUB. SOC.

(externally under a portico or internally as in the ailes), of a range of privies, etc. PERIBOLUS; LOBIUM. 19. 80.

DEANE (KEARNS), who executed at Cork in Ireland many works in conjunction with his brother Sir Thomas Deane, died 30 January 1847. CORK.

DEBOO, DEBOT, or DEBOUT, in Egypt, see PAREMBOLÉ. DEBOURGE (ANTOINE JOSEPH) was admitted 1785 into the Academy of Architecture at Paris. 45.

DEBRET (FRANÇOIS), born 1777 at Paris, was a pupil of Percier and Fontaine. Besides obtaining several medals and premiums 1798-1808, exhibiting 1808-14, and conducting the repairs of the théâtre de la Porte S. Martin 1818, of the old opéra in the rue Richelieu 1819, and the théâtre des Variétés 1822, he built satisfactorily the new opéra, rue Lepelletier, 1821; the théâtre des Nouveautés, 1826, was as unsatisfactory, and therefore the edifice, since called the Vaudeville, has been frequently altered. He was chiefly known as the designer of Simon's paper hangings until 1813, when Célérier resigned in his favour the post of architect to the restorations of the abbaye royale de S. Denis; was appointed architect to that of Notre Dame at Paris; and, 1831, directed the construction of the palais de l'école royale des Beaux Arts, commenced 1819. He became 1825 member of the Académie des Beaux Arts in the Institut de France, and chevalier of the Legion of Honour: at a later period he was succeeded at S. Denis by Viollet le Duc, but was named a member of the conseil des bâtimens publics. He died in retirement at S. Cloud in February 1850. A short memoir by M. Petit appeared in March in the *REVUE DES BEAUX ARTS: BUILDER Journal*, 1850, viii, 109. NORMAND, *Paris Moderne*, 4to., Paris, 1837, gives as by Debret, i, pl. 16, a house 24 rue de l'Est, built in 1824; pl. 25, an orangerie at Auteuil in 1823; pl. 36-40, a house and offices at Corneil; and ii, pl. 76-8, a house and offices at Ville d'Avray in 1828. With LE BAS he published *Œuvres complètes de Vignole*, fol., Paris, 1815. 110.

DEBRIS. A term used in geology to express the fragments of rocks, or of existing formations, which fall down from them, and are not transported to a distance. The term is used in contradistinction to DETRITUS, which expresses another condition of the disintegration of rocks. G. R. B.

DECANICUM. This term, of which the correct meaning is very doubtful, is considered at some length by BINGHAM, *Origines*, 8vo., London, 1840, ii, 457-75, who inclines to the opinion that it meant any building belonging to a church, and used as a fitting place for the confinement of offending ecclesiastics. DIACONUM.

DECASTYLE. The term adopted from VITRUVIUS, iii, 1, for a rank of ten columns or pillars facing the spectator.

DECAY. A gradual destruction of building materials. It differs from DECOMPOSITION inasmuch as it may take place without any perceptible change in the chemical nature of the bodies affected. The principal agent of decay is, in almost all cases, the water, or other mechanically transporting power, to the action of which the material may be exposed; and the disintegration of the body itself may be produced, either by the formation of new salts in the interior, or by the destruction of molecular adhesion under the influence of changes of temperature. The soft and porous stones, as well as other building materials, which present great facilities for the absorption of moisture by capillarity, are particularly exposed to the destructive action of the new salts formed in their interior. These salts, generally speaking, effloresce upon crystallization, and they expand in so doing; thus affecting the molecular aggregation of the body producing them in a manner very similar to that in which the water contained in any body tends to destroy it in freezing. But it by no means follows that because there is a great analogy between the effects produced by the efflorescence of a salt, and the expansion of water in freezing, that the one is a counterpart of the other, although BRARD evidently considered it to be so when he suggested his ingenious



process for ascertaining the durability of building stones. The shape, and the manner of arrangement, of the ultimate molecules of a body must affect all these actions, and it is on account of the infinite varieties of these various conditions in nature that it is almost impossible to form any valuable *à priori* opinion as to the probable resistance to decay of any material. BRARD.

As a general rule it may be considered that building materials resist decay most successfully when they are uniform in their composition, dense in their texture, and of a well defined crystalline character. Those which absorb but a small quantity of water usually resist the destructive action of external causes; and it may be added that, of stones of the same nature, the heavier they are the more durable are they likely to be. When building materials are, on the contrary, composed of conglomerated elements united by a cement, their resistance to decay will depend principally upon the nature of the cementing material. It is thus that the cementing substances in the millstone grits, and the silicious pudding stones of the chalk formations, are as little exposed to decay as the silica of the larger elements of their mass; but in most of the calcareous, or micaceous sandstones, there is so feeble a cohesion in the earthy cements which bind them together, that those cementitious materials are easily detached by frost, or other external agencies, and then are as easily removed; or, in other words, these stones decay rapidly. DISINTEGRATION.

The marked failure of the Caen and of the Anston stone, and also of some varieties of Portland and of Bath stone, in London, appears to be owing to a chemical change in those materials rather than to any 'decay' properly so speaking; and the best illustrations of the latter action may perhaps be found in the manner in which the stones from the subereticaceous group (the fire stones), and some varieties of the more resisting oolites of Portland, Barnack, Kettering, Aubigny, etc., or the harder varieties of the Paris tertiaries, have yielded to the effects of time. In all of these, the softer and less crystalline particles have been slowly removed by mechanical agents, leaving the more crystalline veins in relief; and then, so long as those veins resist the solvent powers which tend to decompose them, they serve to protect the more attackable particles around them. Somewhat the same result occurs with the siliceous rocks, but it is to be observed with respect to them that they only yield to decay (when they are of a crystalline character especially, or in fact are pyrogenic) after some one, or more, of their elements has been decomposed. In other words, the tendency of building materials of these classes, or of an artificial nature, to decay may briefly be stated to depend upon their greater or lesser facility of decomposition. DELIQUESCENCE.

Wood decays principally by the changes which take place in the organic elements of which it is composed; for the woody fibre slowly, but surely, absorbs oxygen from the atmosphere, and is thus imperceptibly burnt. But in addition to this very gradual process, wood is exposed to the putrefactive and the fermentitious destruction of its elements, especially when it is placed in a warm moist atmosphere. The sap retained in wood after it has been felled is indeed exposed for some time to fermentation; and the development of that action favours, in some manner not yet explained, the growth of a species of fungus of a minute filamentary character, which opens the pores of the wood, and thus accelerates its combustion. The durability of wood may then be considered to depend greatly on the ease with which it becomes seasoned, or in fact with which it loses its sap; and it is precisely on account of the difficulties offered by the structure of such woods as elm to the evaporation of the sap, that those woods are so much exposed to decay unless when they are placed in positions in which fermentation cannot take place. The decay of seasoned timber seems practically to be arrested by the application of any material which should fill up the pores and thus prevent the access of air and moisture to the interior; but although such

exclusion of air and moisture may retard the fermentation of the sap, it cannot prevent that process from taking place, and it must indeed be considered rather to aggravate the danger by concealing its progress. DESGODETZ. DRY ROT.

A curious illustration of the decay of the organic substances used in architectural decoration was furnished by the ivory cylinders and ornaments from Assyria. In them the gelatine of the ivory had disappeared in the course of time, leaving the bony structure in a prominent, but by no means pleasing, relief. By soaking in a gelatine, these ivories were restored to their former beauty.

Metals decay, like woods, by the absorption of oxygen from the atmosphere, or from surrounding bodies, which constitutes the slow combustion known to modern chemists by the term *eremacausis*. This oxidation takes place most rapidly when water is present; and it is also to be remarked, as a general rule, that the hydrous oxides are far more easily removed by external agents than even the pure oxides. But a remark of still greater importance is to be made on this subject, namely, that whenever galvanic action is established in, or around, a metal, whether simple or mixed, the decay takes place with an unusual rapidity; and therefore it is not desirable to place two metals permanently in contact when water, or any other fluid, is present. The researches of MAILLET, to which reference has been already made in ATMOSPHERIC INFLUENCE (and CHEMISTRY OF BUILDING MATERIALS), contain nearly all that is known on the conditions of the decay of metals. The only method of preventing this decay is to coat the metals carefully with some substance to prevent air from obtaining access to them; observing all due precautions for the purpose of removing any previously existing scales of the oxides of the metals before applying the protecting coat. None of the protective coatings hitherto introduced are, however, permanent in their effects; so that metals must always be considered to be liable to decay in the precise ratio of their capacity to absorb oxygen.

EBELMEN, *Recueil des Travaux Scientifiques*, 8vo., Paris, 1855. BRARD, *Mineralogie appliquée aux Arts*, 8vo., Paris, 1821. *Transactions BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE*, 1843. Decay in timber is ably treated by PARRY in NICHOLSON, *Journal*, xx, Nos. 85, 86, 87; in the *REPERTORY OF ARTS*, etc., No. 63; and in BREWSTER'S *ENCYC.*, s. v. *Civil Arch.*, p. 595. G. R. B.

DECKER (PAUL), born 1677 at Nuremberg, became 1699 a pupil of Schlüter at Berlin. He engraved several architectural works, six plates of the schloss in that city 1703; *Fürstlicher Baumeister or Architectura Civilis*, fol., Augsburg, 1711, with 64 plates, and supplement, 1716, with 74 plates; and *Architectura theoretico-practica*, fol. Leipsic, 1720, and supplement, 1722; besides many books of Ornament, of which a list is given in HEINSIUS, *Allg. Bücher Lex.*, 4to., Leipzig, 1812. He returned 1706 to Nuremberg, became architect to the district of Salzbach in Bavaria, and died 1713, being then court architect at Baireuth. 68.

DECK PLANK, see DANZIG DECK PLANK.

DECOMPOSITION. The action by which a body composed of various elements loses its normal condition, and allows those elements either to reassume their natural state, or to enter into fresh combinations with other substances. "Simple decomposition" is the phrase used when the body in question decomposes without giving rise to any new compound: 'double', or even multiple decomposition is said to take place when the various elements form new combinations: "spontaneous decomposition" is said to occur when the bodies in which it takes place are abandoned to their own unaided operations; and the decomposition of an intermediate character is that which takes place when fresh agents with which the several elements have a greater affinity than they have with one another are presented to them. Both heat and electricity have marked influence upon the rates of decomposition; and there is one very im-

portant remark to be made with respect to the influence of heat in such cases, viz., that the higher the temperature at which decomposition takes place, the simpler are the new compounds formed under its influence.

The architect is principally interested in the consideration of the decompositions which render the materials he employs susceptible of decay; and it may therefore be desirable to discuss the conditions of such decomposition as they usually exhibit themselves in practice.

All building stones, of whatsoever geological formation they may be, or of whatsoever mineralogical composition, are susceptible of decomposition in water charged with carbonic acid gas. Even the most perfectly crystallized silicates would yield in time to the action of that gas, and would pass into the state of soluble bicarbonates. In the denser and more uniform varieties of granite this decomposition takes place so slowly that it is hardly perceptible, even within geological epochs; but when the proportions of felspar are increased, or a larger quantity of the alkaline silicates are present, the production of a soluble substance is distinctly observable. The felspar becomes, in fact, converted into a bicarbonated silicate of potash, which is rapidly carried away by atmospheric moisture. At Mont S. Michel the felspar is eaten out to a depth of six inches, where the granite is exposed to the sea breeze. So also with the salts of lime; for both the simple and the magnesian carbonates of lime, especially when they are in the earthy, or uncrystallized states, absorb with facility a second dose of carbonic acid; and when the lime they contain has thus passed to the state of the bicarbonate, it also becomes highly soluble. It is to be observed that, firstly, the double silicates pass less rapidly than the simple ones to the state of the bicarbonates; and, secondly, that the more perfectly the crystallization of the carbonates of lime may have been effected, the more permanent are they. It should, therefore, be the aim of the architect to select the more crystalline varieties of the natural materials, and in producing artificially, substances that may replace them, to prefer such as will give rise to the formation of the more durable compounds. The superior power of resistance of the limes and cements obtained from the argillo-calcareous materials, or the magnesian limestones, depends on the formation of a comparatively-speaking insoluble double silicate. DEVITRIFICATION. WATER.

But there are many other agents to which building materials are exposed which are even more destructive than the carbonic acid gas contained in rain water. Thus the air of cities contains sulphuretted hydrogen, ammonia, oxide and carbonate of ammonia; in some states of the atmosphere there is a notable proportion of nitric acid present; and at all times the air of the sea shore contains variable but perceptible quantities of the various salts which are carried off by the vapours rising from its surface. These salts are detained in the porous textures of building materials, and they give rise to some peculiar actions noticed under the head of DELIQUESCENT.

The most injurious effects upon building materials, whether of the earthy or of the metallic class, are, however, those which take place when two substances are brought into contact by the interposition of a liquid, for in that case a galvanic action is established which renders the progress of decomposition infinitely more rapid than it would be otherwise. Indeed, if the expansion of the liquid, absorbed by the pores of the materials, should take place in such a manner as to interfere with the molecular adhesion of those materials, the decomposition will also be facilitated. Extremes of heat or of cold may produce this expansion of the liquid, but it is only injurious when the liquid contains an acid of some description able to act upon the salt of the original material, whereas the galvanic action above mentioned will exercise a destructive influence almost without the intervention of any new agent. Thus, when iron and lead are in contact, as in the case of the feet of railings, or of cramps in masonry, the water falling upon them will produce

a decomposition of the iron by causing it to pass from the state of the carbonate to that of the hydrous oxide. Copper and iron in contact also mutually act upon one another, so also zinc and iron, zinc and copper; but EBELMAN has lately called attention to a decomposition of lead in contact with oak and water, which appears to prove that a destructive galvanic action may be produced between even metals and wood. It is possible that in the latter case the acids contained in the sap may have acted chemically upon the metals exposed to them; but the whole of this subject is involved in such obscurity as to render it dangerous to express any very decided opinions on the subject, beyond this, that it is essential to avoid the contact of two or more metals when a liquid is present for any length of time. A very important note on the decomposition of iron in connection with sand and ballast in water is given in the Papers, etc., of the Royal Engineers, 4to., London, iii, 177.

In the case of woods, the rapidity of decomposition depends almost entirely upon the presence of the sap, for it is upon the changes superinduced by its fermentation, that the destructive modifications of the ligneous texture depend. In themselves, the solid ingredients of wood, which consist principally of pure carbon, are not susceptible of rapid oxygenous combustion; but when the various acids of the sap go through the decomposition of fermentation, they soon affect the other ingredients of the wood. Moist heat is the condition most favourable to the development of the chemical changes in this class of materials; and it is to be observed that they are far more independent of light than are the chemical actions which affect the earthy bases or their salts. DECAY. DRY ROT. WET ROT.

In decorative painting, the decomposition which takes place in metallic colours is often productive of serious inconvenience, and it therefore becomes essential to employ them only when the materials upon which they are employed, or by which they are surrounded, are not likely to exercise any such effect. The general base for oil paints is the carbonate of lead; and if any sulphuretted hydrogen or sulphate of ammonia be present in the atmosphere, the lead will combine with the sulphur in consequence of a double decomposition, and produce a black, unpleasant looking sulphide of lead. The sulphide of zinc is not of such an unpleasant colour as the sulphide of lead, and it may therefore be used in positions where the latter must be excluded. The oils, turpentine, etc., are hydro-carbons, and they decay by the loss of their hydrogen in consequence of the evaporation of their moisture. No efficacious precautions can be taken against the injurious effects of the sulphates of the atmosphere; but an ordinary amount of care may suffice to prevent such an evaporation of the moisture of oil paints as would be likely to promote their subsequent decomposition. ACID.

#### CHEMISTRY OF BUILDING MATERIALS.

G. R. B.

DECOR. This term is used by VITRUVIUS, i, 2, in the passage "*decor autem est emendatus operis aspectus, probatis rebus compositi (al. probatus rebus compositis) cum auctoritate*", to express one of the requisites of a good design. There has been much dispute as to this word, which has in different Latin authors the various significations of honour, propriety, modesty, or beauty. Its English derivatives, decorum and decoration, shew in what an extended sense the word has been used. As it will be necessary frequently to refer to this chapter in the explanation of the other words, and as each phrase depends almost entirely on the proper understanding of the context for its meaning, it will be better to give now a short analysis of the passage. Architecture, he states, consists of ORDINATION and DISPOSITION; this last consists of eurythmy, symmetry, decor (which has been variously translated as 'propriety', 'consistency', and 'fitness'), and distribution or economy. '*Eurythmy*' he defines to be a pleasing and fitting appearance in the composition of the parts of a building, so that the height may have a proper proportion to the breadth, and the latter to the length. '*Symmetry*', he says, is a fitting consent in the parts (*membris*) of a work to each other, just as



there is a relative proportion in the human figure between the finger, wrist, forearm, etc. In fact, it appears that 'eurythmy' is the proportion of the *masses* of a building, and 'symmetry' that between the various parts of the *details*. He then defines 'decor', as the corrected aspect of work (*emendatus aspectus operis*), composed of approved objects with authority (*probatis rebus compositi cum auctoritate*). And this is done by three things, 'station', or 'custom', or 'nature'. The word *statio*, he says, is the same as the Greek *θεωρησις*, and has always been translated as 'position' or the site of a building. This clearly is not what VITRUVIUS means; for he goes on to say, if building temples to Jupiter, to Thunder (probably Jupiter Tonans), to the Heavens (*cælo*), or to the Sun or Moon, the temples should be open to the air (*sub divo*) or hypæthral. To Minerva, Mars, or Hercules, they should be Doric, on account of the power or valour (*virtutem*) of these gods, and the temples should be without decoration (*sine deliciis*). To Venus, Flora, Proserpine, and the Nymphs, the temples should be Corinthian, of graceful and florid architecture, with much foliage, etc. To Juno, Diana, and Bacchus, they should be Ionic, this order holding a mean between the severity of the Doric and the tenderness of the Corinthian. In this there is no sort of allusion to position or site; and though *θεωρησις* may mean 'foundation' or 'position'; its primitive meaning is 'that which is laid down', as a 'dogma' or 'theorem'. *Statio* seems therefore to mean anything dictated or laid down by authority, whether by religious doctrine or the conventionalities of society.

The next subdivision of decor is 'custom' (*consuetudo*); and the offences against this law which he quotes are when magnificent houses have low and shabby (*humiles et inhonestos*) entrances, or if any one should carve Doric dentils on the architraves instead of in the cornices, or when over Ionic capitals any one should place Doric triglyphs. *Consuetudo* is generally translated as 'custom'; but on looking at the derivation of the word its primitive meaning is perceived to be 'common persuasion', or consent of the majority of competent judges. The *decor* of 'nature', he tells us, is first that all buildings should be placed in as healthy situations as possible, particularly the temples to Æsculapius, to Health, and other sanitary deities; and second that bedrooms (*cubacula*) and libraries should face the east; bath rooms and winter apartments the west; and picture galleries and those rooms where there is need of a steady light should face the north. The fact is, the same rules apply '*mutatis mutandis*' to all styles of architecture. A mediæval builder would not make his Lady chapel the gloomiest and worst adorned part of his church; nor would he put a triplet of lancets in a Perpendicular choir, nor a Norman zigzag over a Decorated arch. It seems then clear that, though difficult to express in a single English word, by the phrase 'decor' VITRUVIUS alludes, as would be done in the present day, first to the authority of the past, second to the general ideas of propriety entertained at present, and third to the natural common sense of every one, educated or not. *Detached Essay*, Pocock, *Elements of Design*.

A. A.

DECORATED ENGLISH, GOTHIC, OR POINTED, ARCHITECTURE; the *Absolute Gothic* of WARTON; *Complete Gothic* of PETIT, WHEWELL and WILLIS; *Decorated English* of BRITTON and RICKMAN; *Middle Pointed* of the ECCLESIOLOGICAL, late CAMBRIDGE CAMDEN SOCIETY; *Ornamental English* of MILLER; *Pure Gothic or Transition Style* of DALLAWAY; *Second Order* of MILNER; *Third Period* of REPTON (Fr. *Style ogival secondaire* of DE CAUMONT; also called *Gothique Rayonnant*; Ger. *Ausgebildet* (*Germanischer* or *Spitzbogen Stil*)). The style of Pointed art which may have commenced as early as 1250, and may have lasted until 1450, but which is generally supposed to date in England a few years before and after 1300-75. The date of 1307, given by RICKMAN, appears to be corrected by the periods of the foundation of Merton college at Oxford, and of the dedication, 1277, of the high altar in the choir of its chapel; ARCHAEOLOGICAL

INSTITUTE *Journal*, ii, 137. It has been a fashion to consider this as the complete and perfect development of Gothic or Pointed Art; but critics who so highly eulogize the style or phase of style in its entirety, differ on the question, whether it was most complete and most perfect at the beginning, the middle, or the end of its existence. The Early Complete and Late Complete Gothic of PETIT; the Geometrical and Curvilinear of SHARPE; the Decorated and Continuous, or Early and Late Middle Pointed, of COX and JONES, are equivalent to the Geometrical and Flowing of FREEMAN, who has also provided a Transitional Decorated Period. It seems difficult to find a better explanation of the merits of the style and the distinction of these varieties than that furnished by WHEWELL, *Notes on German Churches*, 8vo., Camb. 1842, 330, who says, the whole phase "is characterized with us by its window tracery, geometrical in the early instances, flowing in the later; but also, and perhaps better, by its triangular canopies, crocketed and finialed; its *nicked* buttresses with triangular heads; its peculiar moldings, no longer a collection of equal rounds with hollows like the Early English, but an assemblage of various members, some broad and some narrow, beautifully grouped and proportioned. Among those moldings, one is often found consisting of a roll with an edge that separates it into two parts, the roll on one side the edge being part of a thinner cylinder, and withdrawn a little within the other. A capital with crumpled leaves, a peculiar base and pedestal, also belong to this style." In fact the most prominent characteristics of the style are the section of the groups of moldings, having a liberal accompaniment of fillets on them, the tracery, the triangular gable over a hoodmold, the BALL FLOWER, a four-leaved flower resembling a square patera, and the arches generally of an equilateral form. RICKMAN, *Attempt*, etc., 8vo., London, 1848, 5th edition, enters minutely into the characteristics of all the details of the style in England.

The best examples of the architecture of this style are comprised in the east façades of Lincoln and Carlisle cathedrals, and of Howden church, Yorkshire; the west fronts of York and Lichfield cathedrals (that of the latter being the richest specimen in existence, but it must be studied with much caution, as the greater part is in compositio, when repaired under James Wyatt); the Lady chapel or Trinity chapel, the lantern tower, and the three western arches of the choir, of Ely cathedral; the choirs of Lichfield and York, the latter is transition to Perpendicular, as is also Edington church, Wiltshire, 1352-61, perhaps one of the earliest examples of it; Carnarvon castle; Thornton abbey, Lincolnshire; Eltham palace, Kent; whilst amongst the most complete of the village and other churches may be named Artleborough, Northamptonshire; Averham, Nottinghamshire; Badgeworth and Leckhampton, Gloucestershire; Bottisham, Sutton, Trumpington, Haslingfield, 1352, and Hatley S. George, 1352, Cambridgeshire; Chelvy, Somersetshire; Donington (chancel later), Ewerby, Heckington, and Silk Willoughby, Lincolnshire; Dronfield, Derbyshire; Elsing and Hingham, Norfolk; Loughborough, Leicestershire; Southfleet and Lullingstone, 1352, Kent; Madley, Herefordshire; North Mimms, Hertfordshire; Bloxham, Oxfordshire, and the chapel of S. Bartholomew, near Oxford. In Scotland the ruins of Melrose abbey are of this period.

The long duration of this style, and the paucity of complete buildings of this class in France, are calculated to excite considerable surprise; but as from 1328 to 1450 the provinces laid waste by war offered a field little favourable to the development of art, architecture remained nearly stationary in France (INKERSLEY). WHEWELL, as above cited, notes only those buildings in France which might be supposed to have been, or were, built under English influence, e. g. S. Ouen at Rouen, 1320, as exhibiting "many features of our style at that period; not only in its tracery, which, as we have already said, appears in France along with the preceding style, but also in many more decisive fea-

tures; thus the bases with their polygonal pedestals, the capitals of crumpled leaves, run through all the original part of this building. The moldings are also in many parts good decorated moldings; but this specimen wants many of the good features of our decorated work, as the enrichments of the buttresses and the canopies of the windows, and is on the whole too plain, except in some particular portions, to be a good example." He instances portions of the choir at Jumièges, the abbaye at Ardenne, near Caen, the church of S. Germain at Pont Audemer, and that of Tour en Bessin near Bayeux, "of which the choir, when complete, must have been a most admirable exhibition of this kind of architecture: and here we have a wall-arcade of triangular canopies, crocketed and finialed, excellent windows, and a singularly skilful and elegant arrangement of vaulting." To these may well have been added the Sainte chapelle at Paris, 1241-8, the earliest specimen, and its copy in the Lady chapel of S. Germer near Rouen; the cathedrals at Metz, Dijon, 1280-1393, Beauvais, Poitiers (west front finished 1379), Perpignan, commenced 1324, Clermont Ferrand, Quimper, and Auxerre; the transepts at Troyes, finished 1314, and at Bayeux; the choirs of Evreux, 1335-40, Carentan, and S. Etienne at Caen; the west front of Strasburgh, 1277-1439; the church at Tarascon, and of S. Nizier at Lyon, S. Urbain at Troyes, 1262-84, S. Pierre at Caen, S. Jacques at Dieppe, S. Martin aux Bois (l'Oise), and S. Jacques at Compiègne; the side chapels of the cathedral at Narbonne; the abbey of S. Bertin and the hôtel de ville, both at S. Omer; the cloister of S. Jean des Vignes at Soissons, and that of Notre Dame at Noyon, with its chapter-house; the façade of S. Martin at Laon; the towers of S. Sernin at Toulouse, and of S. Victor at Marseille; and the Dominican church, the papal castle, and S. Didier, all at Avignon. Some late portions are seen in the pier-arches and triforium of S. Ouen at Rouen, 1490-1515; in the nave of the cathedral of Quimper, 1484-1493; and even the tower of S. Jacques la Boucherie at Paris, 1508-22, restored 1855-6, is considered a notable and very beautiful example.

Specimens in this style are equally rare in Belgium, probably from the same cause as in France; but there exist the Grand Béguinage at Louvain, 1305; and that of Diest; S. Jean at Bois le Duc; Notre Dame at Huy, commenced 1311; Aerschot, 1331; Ste. Croix at Liège; and the chapel of S. Catherine in the cathedral at Courtrai.

Among the best examples of works executed in the fourteenth century in Germany, might have been instanced, somewhat chronologically, the Karmeliter Kloster at Cologne, the cathedral at Utrecht, the collegiat-kirche at Haselach, and the great kloster-kirche at Doberan, part of the cathedrals at Strasburgh and Wurtzburg, the Wiesenkirche at Soest, the Aegidienkirche at Hanover, the kreuzkirche at Gmünd, the choir of the cathedral and the rathhaus at Aix-la-Chapelle, the choir of the Marienkirche at Wismar, the Frauenkirche at Nürnberg, the two great churches at Kampen, the Victorskirche at Xanten, and late in the style, great part of the cathedrals at Cologne, at Prague, and at Ratisbon, as well as of the Petri-Pauli-kirche at Liegnitz.

Among works executed during this time in Italy, are the ospedale grande, Palermo, 1330; the canal front of the ducal palace, 1350, and the ca d'oro, 1350, both at Venice; the Misericordia, Ancona, 1349; and Monza cathedral, 1359.

**DECORATION.** This term has undergone so great a change of signification, that it has become one of the most fruitful sources of discord in architectural discussions. It was formerly used to express all the resources of architecture that were not structural necessities, e. g. the section of a beam is decided by the load, etc., while the propriety of putting stopped chamfers to it is a question of taste in decoration: thus also if a pier be required, the conversion of that pier into a pillar, or perhaps into a column, the application of fluting, etc., are questions of taste in decoration apart from structural requirement. The

title of the great work by Sir W. CHAMBERS, *Treatise on the Decorative part of Civil Architecture*, shows this just and broad view of the subject; and the question is treated in a similar manner by QUATREMÈRE DE QUINCY, *Diet. s. v.*, who is forced to consider decoration in the various phases of work done to please the eye, of congruity in the introduction of positive ornament into such work, of details adopted from various types, of symbols, and of the human figure.

The very word 'decorator' (which was not applied before the commencement of the present century, to a person following a particular branch of business) shows that the term decoration is now allowed to signify the application of ornamental carving, painting, paper-hanging, and gilding by a tradesman, a house painter, or an upholsterer, so that the embellishment of public and private edifices, work in which the artist-architects of former times were trained, is too rarely submitted to their successors; this species of division of labour appears to have been caused by the deficiencies of architects themselves after the time of the Adams and their pupils, and by the introduction of cheap succedanea for materials, as in the case of paperhangings, composition, papier-maché, etc. Books with such titles as *Choix de Décorations*, *Recueil de Décorations*, *Designs for Interior Decorations*, *Modern Embellishments*, *The House Decorator*, etc., are numerous, but none appear to be of a higher standard than collections of ornamental work.

Decoration, in both the above senses, is the artistic, as opposed to the constructional and economic parts of the study of the architect: it would, therefore, be necessary, in a regular treatise upon the subject, to consider unity and variety, i. e., the principles of decoration, under divisions corresponding more or less exactly with the laws of a sound system of æsthetics or the practical requirements coming within the sphere of the architect's observation. These are either scientific, as regards the management of form, chiaroscuro, and colour, and such other skill as requires attainments superior to those of the mechanic; or else they are technical, and such as belong (like carving and painting in all their branches) to the presumed acquirements of the superintendent of the work. Unfortunately it is not possible to supply reference to any such treatise: parts of so desirable a work appeared in the *ATHENÆUM Journal*, 1843, pp. 737, 984, 1011, 1074, 1114, 1162, and continued in the *BUILDER Journal*, xiii, 87, 160, but in a less masterly manner than that in which the subject has been opened by CHATEAUNEUF in *The Country House*, 4to., Lond., 1843, edited by Lady Mary Fox. Mention may also be made of RACKNITZ, *Darstellung und Geschichte des Geschmacks*, etc., 4to., Leipzig, 1796.

**DECORATIVE CONSTRUCTION.** The term employed by WILLIS, *Remarks on the Architecture of the Middle Ages*, 8vo., Cambridge, 1835, p. 15, for apparent, as distinguished from actual, construction,—“the eye, even of an unpractised observer, when viewing a magnificent building is never satisfied, unless the weights appear to be duly supported; and it receives a corresponding pleasure when that is the case. Hence in all complete styles, part of the decoration is made to represent some kind of construction; and the more completely this is effected, the more satisfactory becomes the result. To be sure, this apparent frame is often totally different from the real one, but as long as the inconsistency is concealed, that is a matter of no consequence.”

Some modern writers have arrogated to mediæval art the originality of being the first to decorate construction, when the work of the Greeks and the writings of the Romans show that it was the first principle of every true architect, in every age.

**DEDICATION.** The following memorandum, attributed to AUBREY, is probably taken from his unfinished *Architectonica Sacra*, said to be prefixed to one of his MSS. in the Museum at Oxford, and to treat of the manner of building churches in England during several ages. “When a church was to be built they watched and prayed on the vigil of the dedication,



and took that part of the horizon where the sun arose for the east, which makes that variation, in that few stand true except those built between the equinoxes. I have examined some churches, and have found the line to point to that part of the horizon where the sun rises on the day of that saint to whom the church is dedicated."

According to this hypothesis, a church dedicated to S. Thomas would stand nearly S.E. and N.W.; to S. Agnes, E.S.E. and W.N.W.; to S. Mary, due E. and W.; to S. Mark, E.N.E. and W.S.W.; and to S. John the Baptist, nearly N.E. and S.W. The earliest churches, however, have been erected on no such system, a system which appears to have been developed merely on the spread of the influence of the Roman Catholic church.

**DEDICATION CROSS.** The cross marked upon the walls of a church to show any one of the twelve spots touched with chrism (ARCHÆOLOGIA, xxv, 243, 276) by the bishop at the ceremony of the consecration or dedication of the work, and which are supposed to have been generally external in England; although one cross exists on an internal pillar at Ashwell, Hertfordshire, and although the spots are always inside, on the continent.

WEBB, *Sketches*, 8vo., London, 1848, p. 71, says, of the church of the Virgin, at Treves, that the dedication crosses are very beautiful, being circles containing angels bearing the crosses; p. 108, of the church of S. Laurence, at Nuremberg, that they remain, coloured red, 9½ ft. from the ground; and p. 119, that in the cathedral at Ratisbon, they are crosses flory, gold on a blue ground within a circle of red. The ECCLESIOLOGIST, ii, 49, 80, 111, 171, treats of this subject, mentioning one internally on a Norman pier in New Shoreham church, and externally probably on the jamb of the south door to the church of S. Botolph, at Northfleet, Kent; and at Preston church, Sussex; on the jamb of the north door at Barfreton, Kent; and on the churches at Edington, Wiltshire; Cannington, Somersetshire; Brent Pelham, Hertfordshire; as well as at Salisbury cathedral. Besides referring to the case of S. Fechin, at Foure, Westmeath, mentioned in RICKMAN, *Attempt*, 8vo., London, 1835, p. 293, as having all its dedication crosses (no such statement is there made by that author), the same periodical intimates the existence of an edifice in which they also remain and are made of brass.

DEBREUX (PIERRE ANNE), born at Paris 1788, a pupil of Percier and Fontaine, obtained 1815 the premier grand-prix; and proceeded to Rome as one of the pensionnaires at the villa Medici. He was the first of them to depart from the usual routine, and left Rome in company with professor Donaldson, then studying in that city. They went through Albania and Northern Greece to Athens; where, hearing that Huyot was at Smyrna, they at once joined him there. The three then visited all the towns in Asia Minor between Pergamus and Cnidos, measuring and drawing the remains of the ancient cities and buildings, Dedreux's special attention being directed to taking views of the more celebrated spots, for which his skill as a draughtsman eminently qualified him. He designed at Paris the chapel of the Virgin, and the presbytery of the church of S. François d'Assise; the *salle des concerts* in the rue Taitbout at Paris; a theatre in one of the boulevards; and the *château de Pont-Leroy* for M. Casimir Perrier. He was appointed one of the government architects, and published (according to GABET, *Dict. des Artistes*, 8vo., Paris, 1831) *Voyage en Italie, en Istrie, en Grèce et en Asie Mineure*, fol. He died about 1848. One of his sons who survived him, inherits the artistic genius of his father, and is the celebrated French horse and animal painter.

T. L. D.

DEERING, see GANDY-DEERING (J. P.).

DEFETIN (JEHAN) is mentioned as the architect, 1506, of the choir of the church of S. Aspais at Melun, by the COMITÉ HISTORIQUE DES ARTS, etc., *Bulletin*, 8vo., Paris, 1842, ii, 473.

**DEFLECTION.** The change of form produced in a beam

when its upper surface becomes depressed below its original level, whether caused by an extraneous weight, or merely by that of the unsupported part of the beam itself. When one extremity is securely fixed and a weight applied upon the length, the beam will be deflected, and will assume a curved outline of equilibrium; the elasticity of the fibres counteracting the applied weight. Whilst in this state, the upper fibres of the beam will be in a state of tension and the lower ones in a state of compression; and the forces thus developed will cause the beam to reassume its original horizontality as soon as the weight shall have been withdrawn, provided a permanent set be not produced, or the limits of elasticity be not exceeded. The laws of elasticity of flexion, or of the power of beams to resist deflection, have been explained thus by COULOMB; 1. The deflection, or the depression of the extremity of the bar below the original level, is proportional to the weight; 2. The weight required to produce a certain depression is proportional to the width of the bar; 3. The weight is in the ratio of the cube of the depth; 4. It is in the inverse ratio of the cube of the length. Or calling  $a$  the deflection,  $P$  the weight,  $l$  the length,  $b$  the width,  $e$  the depth of the beam, and  $c$  a constant varying with the substance of which it is composed, the formula for calculating the deflection becomes

$$a = \frac{P l^3}{c b e^3}; \text{ from which is derived } P = \frac{c a b e^3}{l^3}$$

CIVIL ENGINEER *Journal*, xi, 1. PERMANENT SET. G. R. B.

**DEFUTARIA (CELLA).** This term has been supposed to have been the place where the defrutum or must was boiled. But this cannot be correct, as it is evident from COLUMELLA, i, 6, that it was a subdivision of the cellars for depositing wine, oil, etc.; and he subsequently says these should not be near baths, or furnaces, or cisterns of water, because either of them would cause changes of temperature, and would be most prejudicial to wine. It was probably the cellar or place where the defrutum was preserved; for the same author, xii, 21, says it should be kept a year before it is used.

A. A.

**DEINOCARES**, or in the Latin form **DINOCARES**, sometimes called **DEINOCRATES** or **DINOCRATES**, is mentioned by VITRUVIUS, ii, pref., as a Macedonian architect who, after the rejection of his proposal to convert mount Athos into a statue of Alexander the Great, was employed by that prince in the arrangement and erection of the city of Alexandria, B.C. 331. This story of the gigantic image is attributed to Stasicrates, a Bithynian bronzeworker, by TZETZES, *Chil.*, 199, 367, and by PLUTARCH, *De Alex. Virt.*, ii, 2, who also, *Alex.*, 72, states that this Stasicrates was employed to arrange the magnificent funeral pyre (DIOPORUS, xvii, 115) of Hephæstion at Babylon, B.C. 325-4: on the other hand, the story of mount Athos is attributed to Diocles of Rhegium by EUSTATHIUS, *Ad Hom.*, xiv, 229. The architect who built Alexandria and proposed the subject of Athos is called Cheiocrates or Cheiromocrates in some MSS., Deinocrates by STRABO, xiv, who intimates that he was previously engaged in rebuilding the temple of Artemis at Ephesus, after the celebrated fire B.C. 356; and the Ephesian and Alexandrian employment of Dinocrates is supported by SOLINUS, *Polyhist.*, 35, 43: the Alexandrian alone is mentioned by AMMIAN, xxii, 16; and by VALERIUS MAX., i, 4, who writes the name Democrates (? Deinocrates) or Dinocrates; but PLINY, *H. N.*, v, 11, vii, 38, calls him Dinocrates, and xxxiv, 42, gives the anecdote of the purpose of Ptolemy Philadelphus to build a temple in Alexandria in memory of the Arsinoë whom he married B.C. 279; this temple was commenced with a view of putting a roof (not a lining) of loadstone that should keep in mid-air an iron statue of Arsinoë, by an architect named Dinocrates, or in some MSS. of PLINY Timochares; the form Dinocrates is used by AULONIUS, *Idyl.*, x, 310; and the work was stopped by the death of the king, B.C. 247, probably after that of the architect. But as the dates given by these authors comprise at most a hundred and nine years, and at least fifty-two, it is not probable that all the events narrated

by them can relate to the life of one artist. MULLER, *Ancient Art*, p. 80, 124, 126, states that the name is sometimes written Timocrates.

DEIS, DES, DESSE, see DAIS.

DEKKEH or DAKKEH in Nubia, see PSELGIS.

DELABOLE, or as it was formerly called, Dennyball, is the name of a celebrated slate quarry, situated near Camelford and in the parish of Tintagel, on the north coast of Cornwall. It is in the midst of a district of similar quarries, but its produce surpasses that of any of its neighbours in excellence.

Towards the close of the last century the water gained so much on the quarry as to interfere greatly with its successful working; and for many years the difficulties occasioned by the absence of efficient pumping apparatus, and by the want of a sufficient capital to erect machinery for working the quarry economically, tended to lessen by degrees the consumption of Delabole slate, and to open a ready market for Bangor and other slates which hold now a prominent place in public estimation. Of late years, however, the quarries have been most efficiently worked, and roofing slates, paving, cisterns, and chimneypieces of every ordinary dimension, are prepared in large quantities for sale.

The following lists exhibit the sizes and weights of the various descriptions of slates as supplied.

Description of Slating.	Size.	First Quality.		Second Quality
		Average Weight.	Estim. Surface	Average Weight.
Queens .....	32, 34, 36 by 16, 17, 18	115 per 1200	104 per 1200	
Princesses .....	30 by 15	115 per 1200	111 per 1200	
Ditto .....	28 " 14	87 " 124	80 per 1200	
Ditto .....	26 " 13	82 " 111	65 " "	
Duchesses .....	24 " 12	65 " 9	51 " "	
Marchionesses .....	22 " 11	54 " 7½	40 " "	
Countesses .....	20 " 10	43 " 6	31 " "	
Viscountesses .....	18 " 9	35 " 5	24 " "	
Ladies .....	16 " 8	25 " 4	14 per 1000	
Small Ladies .....	14 " 7	19 " 3	1 per 1000	
Doubles .....	12 " 6	13 " 2½	1 " "	
Imperials, for roofing various lengths ..	5 to 7 wide	.. ..	sold per foot run.	
Ditto ditto .....	8 to 10 "	.. ..	.. ..	
Rags .....	.. ..	12 doz. per ton	24 per ton	20 doz. per ton
Seantle .....	various	13 doz. pr. 1000	14 per 1000	
Common .....	.. ..	10 " "	1 " "	

Rough slate flooring is supplied from 1½ to 12 superficial feet in each stone, varying in thickness from ¾ in. to 2 ins.; for large cisterns and tomb stones, from 12 to 20 ft. in a stone, from 1 in. to 2 ins. thick; for window stones, step stones, and edgings for gardens, from 1 in. to 2 ins. thick.

#### FLOORING, sawn all around—

For covering for walls, not faced, ¾ in. thick.

Or faced, ¾ in. to 1 in. thick, averaging 3½ feet in each stone.

Or brought true on the face, 1 in. to 1½ in. thick, fitted for floors of any dimensions, or for hearth stones, averaging about 8 ft. in a stone.

For pavements, 1½ in. to 2 ins. thick, averaging about 10 ft. in each stone.

Or large head and tomb stones, from 8 ft. to 18 ft. in a stone, 1 in. to 1½ in. thick.

Or 2 ins. thick, and from 8 ft. to 20 ft. in a stone.

For entrance halls and pavements, 16 ft. to 24 ft. in a stone, 2 ins. thick.

Chimney and skirting stones, any width up to 1 ft.

Window stones, step stones, etc., 1½, 2, and 3 ins. thick, from 9 ins. to 12 ins. wide.

Feet.	LARGE SLABS, from—	
10 to 30 in a stone, from 1½ in. to 3 ins. thick, of various lengths and breadths		
20 " 40 "	1½ " 3 "	" " "
30 " 50 "	2 " 3 "	" " "
40 " 60 "	2 " 3 "	" " "

For nearly three hundred years Delabole slate has been famous; and CAREW, *Survey of Cornwall*, 4to., London, 1602, says, it is "in substance thinn, in colour faire, in waight light, in lasting strong, and generally carrieth so good regard, as (besides the supply for home provision) great store is yeerly conveyed by shipping both to other parts of the realme, and also oeyond the seas into Britainnie and Netherland." BORLASE, *Natural History of Cornwall*, fol., Oxford, 1758, says, "the best covering slat which we have in Cornwall, and indeed in all England, perhaps the finest in the world, is at Dennyball,

ARCH. PUB. SOC.

about two miles south of Tindagel, which will require our more particular notice. The whole quarry is about three hundred yards long and one hundred wide; the deepest part from the grass, is judged to be forty fathoms." He then describes the depths of the various qualities of slate, and says, "you are not at the best till you come to twenty-four fathom deep from the grass; then rises what they call the *bottom stone*, of a grey blue colour, and such a close texture that on the touch it will sound clear, like a piece of metal." His description of the method of working the quarry is entertaining, and indicative of the difficulties our immediate ancestors had to surmount in the production of material; but it will be only necessary here to quote the following paragraphs. "The principal horizontal fissures, which divide the *strata*, run from ten to fifteen feet asunder; they are no more than chinks or joints, and contain no heterogeneous fossil. The stone of this quarry weighs to water as 2.66 are to 1, is not subject to rot or decay, to imbibe water, or split with falling, as the *bottom stone* of Tindagel and other quarries; but for its lightness, and enduring weather, is generally preferred to any slat in Great Britain." He states it "to weigh only 2512 oz. to the hundred feet, which is greatly less than the lightest Westmorland slate that I have met with." WATSON, *Chemical Essays*; DE LA BECHE, *Geology of Cornwall*; CONYBEARE, in a communication to the Geological Society; and other authorities, report also in most favourable terms of this slate.

W. D.

DELAGARDETTE, see LAGARDETTE (ABBÉ C. M. DE).

DELANNOY (FRANÇOIS JOSEPH), born 24 October 1755, erected, conjointly with J. B. Blondel, the building called the Temple at Paris as it now exists, LEGRAND and LAMPON, *Descr.*, 8vo., Paris, 1809; and is mentioned as the designer, 1806, of the house numbered 38 in the avenue des Champs Elysées, illustrated by NORMAND, *Paris Moderne*, 4to., Paris, 1843, ii, 58-9, who gives, pl. 90-1, the hospice de la Reconnaissance at Petit l'Etang, near S. Cloud, as a joint work of Delannoy and Gauthier: the former died 27 April 1835. He is the subject of an éloge by EVERAT, *Souvenirs de la Vie*, 4to., Paris, 1839, which the writer of this article has not seen. His son obtained 1826 the second, and 1828 the first grand-prix; became member of the école royale des Beaux Arts, and architect to the bank of France, and to the municipal board of public works.

89. 110.

DELARUE (JEHAN) was appointed 1542 with Simon Vitcoq to examine Becquet's design for the spire at Rouen cathedral, according to DEVILLE, *Rouen*, 8vo., Rouen, 1848, p. 65-6, who shows that Delarue had built 'moitié antique et moderne' the church of S. Martin.

DELESPÉE ( . . . ) the elder was admitted 1728 a member of the Academy of Architecture at Paris: Delespée the younger attained the same honour 1747, and died 1792. 45.

DELESPINE. Three architects, great-grandfather, grandfather (who was admitted a member of the Academy of Architecture at Paris 1699 and died 1729), and father, preceded Pierre Jules DELESPINE, born at Paris 31 October 1756. He designed the marché des Blancs Manteaux in that city 1813; this he published, fol., Paris, 1827, and again in 1834-5; it was restored 1840 by Peyre. The Institute of France, which had elected him a member 1825, printed on his death, 16 September 1825, an éloge written by VAUDOYER. Blouet was one of his pupils. 110.

DELFT. The principal town of the canton of the same name in the arrondissement of the Hague, and in the province of North Holland, is situated upon the river Schie. It is remarkable for the cleanness and regularity of its streets, and for retaining a comparatively greater number of mediæval houses than any town in the active parts of Holland. There are several very characteristic specimens of the fourteenth and fifteenth centuries (*Illustrations*, s. v. Façade); but the most interesting monuments are the Prinsenhof, once the palace of the princes of Orange, built in the fifteenth century in the

v



Burgundian Flamboyant style, but lately used as a barrack; the oude kerk, dedicated to S. Hippolitus, commenced 1240; the nieuwe kerk, dedicated to S. Ursula, 1381-4, this has a picturesque steeple, the nave and aisles of the chancel are adapted to the Reformed service, whilst the former choir (re-built 1515 by Van der Burch) and ambulatory are the burial place for the royal family; the Gemeenlandshuis; and lastly the raedthuis, designed by H. de Keyser before 1631, restored 1838, enclosing a massive tower of the fifteenth century. Excellent views of these buildings, etc., are given in BLEYSWIJCK, *Beschryvinge der Stadt*, 4to., Delft, 1667; and the town hall is specially illustrated in pl. 37 of DANCKAERTS, *Arch. Moderna*, fol., Amst., 1631. Besides these and the hospital church, there are two Roman Catholic, and three other churches. Delft is the arsenal of Holland; the old magazine still serving as a dépôt for small arms; the former Dutch East India house for the clothing and tent store and saddlery, the constructiewinkel for the workshops, and the old laboratorium for the ammunition store. 50.

Delft was formerly renowned for the fabrication of *plateel*, a beautiful description of earthenware (Fr. *faïence*; *hollandaise*). The staple of these articles was the alluvial clay of the neighbourhood, which was covered with an opaque stanniferous glaze, and upon this glaze the patterns were drawn by hand. The Dutch tiles, as they are called, so commonly used in England at the end of the seventeenth and the beginning of the eighteenth centuries were mostly made at Delft; at the present day the manufacture has entirely ceased, and nothing but an inferior imitation of English hardware is now made. The best samples of old Delft ware are to be met with at the Hague. MARRYATT, *Hist. of Pottery*, 8vo., London, 1850; VAN OLLEFEN, *De Nederlandsche Stadt*, 8vo., Amst., 1793, ii, 10. G. R. B.

DELHI, sometimes written DEHLI. The usual appellation for the capital of the province of the same name in Hindostan. The damage arising from the siege in 1857 has not yet been detailed in an authoritative form. FERGUSSON, *Handbook*, 8vo., London, 1855, p. 416, introduces a general notice of Delhi by the statement that "by far the most interesting group of ruins that exists in India, or perhaps in any part of the world, is that which is grouped round the tall column of Victory which Kootub erected at Delhi within the precincts of the palace of the unfortunate Pirthay Raja, to celebrate his conquest of the Hindus. In front are the ruins of Togluckabad, the gigantic fort of an old Pathan chief; and farther north the plain is still covered with the ruins of Old Delhi, the capital of the later Pathans and earlier Moguls." This, also called Indraput (Sanskrit *Indraprastha*), is stated to have covered about twenty-five square miles.

At the distance of nine or ten miles from the Kootub minar is NEW DELHI, properly SHAHJAHANABAD, refounded 1628-31 at the north-west corner of the old city by Shahjehan, in whose reign, 1628-58, the palace and the great mosque were erected. The town possessed seven fine gateways, but only two wide streets, one, leading from the palace or fort to the Lahore gate, being a mile in length and 120 ft. in width; the other, from the same palace to the Delhi gate, being five furlongs in length and 90 ft. in width, has along the centre the canal called Ali Merdan Khan's or Hastings's aqueduct, restored 1817-20, by which water is supplied to Delhi from the Jumna at Kernaul, distant seventy miles. The town is described in FORBES, *Oriental Memoirs*, 4to., London, 1813, iv, 61, who details the mansion occupied by him at the length due to so good a specimen of the best houses in India. At that period the city was about sixteen miles in circuit, having low and mean houses bordering streets that were paved chiefly with bricks; and the fort had rather the appearance of an ornamental wall, as the towers which served for bastions were covered with domes of white marble. Besides the mosques, at least forty in number, some of which had gilded domes, there were numerous palaces and pavilions on the bank of the Jumna and in the town; these

were chiefly erected during the reign of Shahjehan's successor Aurungzebe, but generally, as FERGUSSON observes, p. 448, "they are either in ruins or used as shops: and, though splendid, they show that degradation of style which had then set in." The city is also described by FRANKLIN in the *Asiatic Researches*, 4to., Calcutta, 1795, iv, 419, in a manner which contrasts strongly with the laudatory tone adopted by FERGUSSON, pp. 412-50, who gives a long description of the palace, considering the two halls as finer, larger, and richer than the corresponding buildings at Agra; indeed he has stated, p. 448, that no palace now existing in the world possesses an apartment of such singular beauty and elegance. The same author, p. 430, illustrates the Jumma Musjid as "the type of a Mogul mosque" (FORREST, *Picturesque Tour*, 4to., London, 1822, pl. 21, shows some differences), and p. 434, a Pathan tomb in Old Delhi; besides several illustrations, pp. 416-21, of the works (also described in the *Asiatic Researches* by BLUNT, iv, 318, and by EWER, xiv, 480) round the Kootub minar, which date 1193-1235, having been left unfinished by Altunsh, whose tomb is behind the northern range, and who may have completed the pillar itself that was chiefly constructed 1205-10: he also notes, p. 80, that the collection of Jaina remains at the base of the tower "form the most picturesque and interesting group of ruins now found in Northern India, and for elaborate exuberance of detail are almost unrivalled even in India." This pillar, damaged by earthquakes 1780 and 1803, was repaired under Major Smith of the Engineers 1826; three hundred and four granite steps lead to the top, whence the cupola, placed after that time, has disappeared; it is also illustrated by DANIELL, *Views*, fol., London, 1795-1807, who in other plates shows the great eastern gate of the Jumma Musjid, and the front (in the courtyard of the mosque itself); the mausoleum of Amsir Khusero, a son (?) of Jehangir; a baolee or tank; the palace of Coodseah Begum, mother of Mahmood III, with the fort-palace in the distance; the western gate of the citadel, in Old Delhi, called the cotillah of Firouz Shah II, 1351-88 (his shikargah, hunting palace, or menagerie (?) is illustrated in the *ASIATIC RESEARCHES*, vii, 175); ruins in the vicinity; the western entrance of the fort of Shere Shah 1540-53; ruins near the tomb of Humayoun; the observatory of Jyasingh, who became rajah of Ambheer 1693, or rather its instruments, which are described in the *ASIATIC RESEARCHES*, v, 190; KITTOE, *Illustrations*, fol., Calcutta, 1838, gives the *lal darwaza* or red gate of Old Delhi, with the ruins of the "kutilla" or cotillah, half a mile south-east of the *lal darwaza* of New Delhi.

The principal other buildings were the black mosque, *kala musjid*, of Pathan work, *i.e.* before 1525; the mosque built on the bank of the Jumna by a daughter of Aurungzebe, called Zeebul or Zeenul al Nissah, who died 1710; her tomb, like that of the wife of Mahmoud III, Malka Zemani, who died 1769, is near the Cabul gate; outside the Ajmere gate the *medresseh* or college, of a son (?) of Nizam el Moolk, called Ghazi ed Deen, who died 1753, and his celebrated tomb; near it is the tomb of the vizier of Mahmoud III, Kummer ed Deen Khan, whose palace was among the chief mansions; as were also that of Sultan Dara, brother of Aurungzebe, occupied by the English residents; of Ghazi ed Deen Khan; of Ali Merdan Khan; of Saadet Khan, which has long been in ruins; and of his nephew and successor Sefdar Jung, who died 1756; the tombs of this Sefdar; of Mahmoud III; of a daughter of Shah Jehan called Jehanara Begum; of Humayoun's vizier Fazem Khan; of Humayoun; of a Mahomedan saint named Nizam ed Deen; and of the caravanserai of the princess, erected by the Begum Sahib, the eldest daughter of Shah Jehan. BERNIER, *Travels* (in 1663), 8vo., London, 1826, i, 272; MACKENZIE, *Six Years in India*, 8vo., London, 1857; ILLUSTRATED TIMES JOURNAL, fol., London, 1857, v, 81-91. MOGUL BUILDINGS.

DE L'ILE, or DELISLE MANSARD (PASQUIER), admitted, 1699, a member of the academy of architecture at Paris; designed the house commenced in the precincts of the Temple

in that city by Jacques de Souvré, grand prior in France of the order of St. John of Jerusalem, 1667-70, for his successors: it was altered 1720 under Oppenord. BRICE, *Nouvelle Description*, 12mo., Paris, 1725, ii, 73.

45. 68.  
DELINEATOR. An instrument for taking the profile of a molding, cornice, or any curved figure. It was patented May 21, 1844, by O. D. Mordaunt, and consists of two bars between which slide a number of very thin slips, the end slips being stronger to support the others. In use, one end of the slips is pushed against the molding or figure to be copied; and the form is obtained by laying the instrument on a sheet of paper and tracing with a pencil the outline of the slips. A spirit level, a square and a slide to ensure truly horizontal and vertical lines can be added; and the number of the slips extended to any practicable length. *The Civil Engineer Journal*, vii, 237, gives an illustration. CYMOGRAPH.

DELIQUESCENT. Some bodies, especially the salts, possess the property of absorbing moisture and passing into a semifluid state, which is known by the name of 'deliquescence'; and such bodies are said to be 'deliquescent'. Such salts are used, on account of the avidity with which they absorb moisture, to dry the air in chemical experiments: the chloride of potassium is most frequently employed for the purpose. Common sea salt is amongst the most deliquescent of this class of bodies, and as it is thrown out upon the surface of any lime or cement renderings executed with materials mixed with ordinary sea water, it is unadvisable to execute any decorative work upon them until the whole of the uncombined water has been given out. So long also as the efflorescence of the salt may be proceeding, the materials furnishing it must remain damp; and a similar dampness may be observed in all porous absorbent building stones exposed to receive the atmospheric moisture of the sea shore, whether in the form of rain or of vapour, because that moisture contains a sufficient quantity of salt to allow of its deliquescence under conditions of great danger to the materials in which it is retained. The moisture which is attracted by the deliquescent salt thus produced is also one of the most active causes of the decay of the building materials susceptible of the mechanical action of water during its changes of state; and it is on account of these combined actions, viz. the efflorescence and the deliquescence of the common salt furnished by the sea air, that the softer oolites, such as Caen stone, do not resist the action of the atmosphere when used near the sea shore. CONDENSATION. DECAY. EFFLORESCENCE. G. R. B.

DELIQUIA. A term which is used, for part of the means of taking water off the roof of a cavædium displuviatum, by VITRUVIUS, vi, 3, who says that in such construction, "deliquia arcam sustinentes stillicidia rejiciunt"; FESTUS, s. v., explains delicia as "tignum quod a culmine ad tegulas angulares infimas versus fastigium collocatur, unde tectum deliciatum, deliciares tegulae." The two passages suggest the idea that delicia might have resembled the joist connecting the curb of a lantern with the gutter at the bottom of the roof.

DELORME, see LORME or LOURME (PIERRE DE), and ORME (PHILIBERT DE L').

DELOS. The smallest of the islands called the Cyclades in the Ægean sea, being little more than a rock, called Mount Cynthus, and about a mile in its largest diameter. The town was situated on a sort of plain at the western side. STUART and REVETT, *Antiquities*, fol., London, 1794-1816, iii, 57, illustrate the Doric columns of the temple to Apollo, with shafts fluted at the extremities only; others of the portico of Philip, with a plate unexplained, which appears to belong to it; and an altar decorated with bulls' heads; and iv, 33, the remarkable bull capitals and bull-headed triglyphs with other fragments: an editorial note signifies the loss, 1785, from various causes, of many of the antiquities seen not only, 1650, by SPON and WHEELER, *Travels*, 8vo., Lyons, 1678, but in 1670 by PITTON DE TOURNEFORT, *Relation*, 4to., Paris, 1717, i, 290. Yet the notes of this last named traveller are repeated

in BLOUET, *Exped. Scient. de Morée*, fol., Paris, 1836, iii, 5, who devotes twenty-two plates to the temple of Apollo, the portico of Philip, the building with bucrania (his restoration varying considerably from that in STUART, iii), the theatre, 226 ft. across its greatest diameter, with seats 63 ft. deep, the gateway, and numerous stelæ, ornaments, etc. LEAKE, *Northern Greece*, 8vo., London, 1835, iii, 95, mentions the ruins of the theatre, of white marble, as singular in having two projections adjacent to the orchestra, by which means the lower parts were in this portion prolonged beyond the semicircle: the diameter, including only the projections, is 187 ft. (203 ft. in BLOUET), and in the course of his remarks indicates the existence of many ruins of ancient houses neatly constructed with mortar. The whole of his account deserves careful comparison with those of TOURNEFORT and BLOUET. The supplementary volume to STUART, fol., London, 1830, contains the western gateway on Mount Cynthus; fragments of marble roof-tiles; semi-columns back to back with a small pilaster between them like those at Mylasa; marble tombs in the adjacent island of Rhenea, the cemetery of Delos; and corrections of the former illustrations of the bull-capitals; all by KINNAIRD.

Before the invention of the Corinthian bronze, the æs Deliacum had the greatest reputation: CIC., *pro Rosc.*, 46; *in Verr.*, 2, ii, 34; PLINY, *H. N.*, xxxiv, 2.

DELPHI (the modern Castri). A town of Phocis in Northern Greece, occupying on a series of terraces down to the river Pleistus, a rocky theatre-shaped position, backed by the precipitous face of the Parnassian range, which rises abruptly from the town. Delphi was one of the sacred towns of Greece, celebrated also on account of its Pythian Oracle, the far-famed temple, and the games held in honour of Apollo, under the protection of the Amphictyonic Council and the whole of Greece. Its architectural features were therefore highly important; most of them are enumerated by PAUSANIAS, in his book on Phocis, who, entering the town from the east as from Lebadia and Thebes, mentions first four temples, three of which seem to have been even then either in ruins or in a neglected state, and that of Minerva Pronaos alone to be in a condition fit for worship: a triglyph and frustum of a Doric shaft were found near. The gymnasium occupied the spot where the church of the Panaghia now stands. The main road probably passed then, as now, near the Castalian font or bath still existing, cut in the rock; it is about 33 ft. long by nearly 10 ft. wide and 7 ft. deep, with steps leading down to it; a conduit and niches are also cut in the face of the rock. Terrace walls of massive polygonal blocks exist in many parts. The temple probably occupied the site on which the village of Castri now stands: not a fragment remains of this illustrious fane; but there are some considerable walls covered by inscriptions, some of which are published by BÆCKH, in *Corp. Inscr. Græc.*; one wall 20 ft. long by 10 ft. high is covered with them, the letters of which are half an inch in height. It is difficult to fix precisely the position of the theatre, mentioned by PAUSANIAS as attached to the temple, unless the stone seat behind this wall of inscriptions be in its place. He also enumerates the treasures; for the supposed sanctity of the temple induced many states, sovereigns, and individuals to place there, as an inviolable sanctuary, vast treasures: but the accumulation of these riches was the cause of its being repeatedly sacked by the Greeks and Romans, as well as by the Persians, Gauls, and other barbarians, so that scarcely a vestige remains of its sumptuous edifices. The fountain of Cassotis and the seat of Hierophile are distinguishable, the latter by its architectural aspect, as cut in the rock. Higher up is the stadium; one or two of the marble seats constructed by Herodes Atticus still remain: one belonging to the uppermost row had a back, as in many Greek theatres. A length of about 650 ft., and a breadth of 113 ft. 3 ins., are easily ascertainable. The road, entering the town from the west, led to the plain of Crisea below, in which were doubtless held the chariot races, for there is not any pos-



sible platform in or near the city sufficiently extensive for the purpose. On one side of this road, about five hundred yards from the entrance into the ancient town, are numerous tombs, some single, others excavated chambers for two or more coffins. Over the arch in one of them is the head of an ox or boucranium, the symbol of Delphi, as shewn on the medals. An ancient road or way behind the town, and passing behind the stadium, leads to the summit of Parnassus; the cave of Corycia, reached by a two hours walk, is about 200 ft. wide by 350 ft. long, with immense stalactites from the lofty roof; at the further end is a gallery, the extent of which has never been ascertained in modern times. At the entrance of the cavern are some stones, evidently worked to receive columns, with an inscription to Pan and the Nymphs.

T. L. D.

The temple seems to have been hexastyle, of a Doric order externally with Ionic internally, rebuilt after the fire, B.C. 548, from the designs of Spintharus. A capital belonging to a column of a Doric order, resembling those of the so-called portico of Philip in the island of Delos, but distinguished by the abrupt termination of the flutes and very faint annulets; a plan of the Castalian fountain or rather bath, the architrave of a door, and the profile of the seats in the stadium, are given in STUART and REVETT, *Antiquities*, fol., London, 1816, iv, 29. ULRICH, *Reisen*, Bremen, 1840; LEAKE, *Northern Greece*, 8vo., London, 1835, ii, 551; WALPOLE, *European and Asiatic Turkey*, 4to., London, 1820, i, 310; LEAKE, *Northern Greece*, ii, 551; MURRAY, *Handbook*.

DELPH STONE, or York landing, see BRAN and YORKSHIRE STONE.

DELTOS is given, without notice of any authority, in LIDDELL and SCOTT, *Lexicon*, s. v. *δέλτος*, as equivalent to AETOS and TYMPANUM.

DELUBRUM. A word used in relation to the sacred rites of the Romans, on which there has been so much controversy that the question is abandoned in SMITH, *Dict. Ant.*, s. v. *templum*. Some writers have thought that it had a double signification, and thus have eluded the difficulty, which is an important one, in architectural descriptions. FESTUS says it means "a trunk of a tree delibrated (that is stripped of the *liber* or bark), which was worshipped"; and in this he is followed by SERVIUS, *Comment. ad Æneid.*, iv, 56, who says *delubrum* is what the Greeks call *ἱερόν*; which word is rendered by STIDAS and by HESYCHIUS, "an image, idol, or statue"; but very curiously, SERVIUS, ii, 225, gives as another derivation "the place before a temple where water runs for purification, a *deluendo*"; and in this he is corroborated by M. CORNELIUS FRONTO, *De Diff. Vocab.*, 8vo., Rome, 1823, p. 351, whose words are "*delubrum*, in quo homines pericula sua deluunt" (in some versions *deluunt*) "ponunt enim vel pileum (? *pilum*) vel scutum, vel alia (? *plura*) suscepta votis." Others have said that the word was properly *delabrum*, the place where there was a labrum for the purpose of washing, etc. For the use and derivation of *labrum*, see the *Detached Essays*, BATHS, etc. OVID, *Met.*, i, 373, saying "ad *delubra* *Dæ*, quorum *fastigia turpi squalebant musco*", clearly shows that *delubrum* meant a covered place, and consequently not an area. As if purposely to show how uncertain the meaning of the word was even in the days of SERVIUS, in a passage preceding that last quoted he actually gives a third meaning, and says "*delubrum* is a place where there are several deities under one roof, as the Capitolium in which are Minerva, Jupiter, and Juno."

The best authority would probably have been the work of VARRO, but that is imperfect; MACROBIUS, *Saturnalia*, iv, 3, has however preserved a very important fragment of that author which runs thus: "VARRO in his eighth book of divine things says, '*Delubrum* some consider to be a place in which, besides the temple, there is an area set apart for the god, as there is at the temple of Jupiter Stator in the Circus of Flaminius; others the place in which the image of the god is dedicated'; and he adds, 'as the place in which a candle is fixed is called *candela-*

*brum*, so that in which a god (*deum*) is placed is called *delubrum*.'" That there was a difference between "*templum*" and "*delubrum*" is most probable from a passage in CICERO, *De Nat. Deor.*, iii, 95, in which he says, "the contest is for our altars and domestic hearths, for our temples and *delubra*"; and that PLINY, xxxvi, 22, did not consider "*delubrum*" to mean an image is clear. He describes "at Cyzicum a *delubrum* in which the artifex has inserted a golden thread into all the joints of the polished stone," and says within is dedicated an ivory Jupiter and a marble Apollo crowning him. It is curious among so many places where the word is used we find no description of doors, windows, etc., in connexion with the word. JUVENAL, *Sat.*, xiii, 69, indeed speaks of the swarm of bees hanging from the *culmen* of a *delubrum*, but this may mean a top of anything as well as a roof. *Delubrum* may have meant neither the temple nor the image, but the *shrine* within which the latter was placed, and which stood in the former. This would be in consonance with the statement of PLINY, and with the dictum of VARRO that it is derived from "*deus*" as *candelabrum* is derived from "*candela*". It would also be the place for sacrifice, and probably would contain a fountain for the purpose of purification; and moreover it would show how there might be three *delubra* under one roof and within one *ædes*.

A. A.

BURGESS, *Topog. of Rome*, 8vo., London, 1831, i, 274, says that "a *delubrum* might either be of the nature of an *ædes* or *templum*, providing that, independently of the edifice itself, there was an additional area dedicated for religious purposes, or that sufficient space was left between the altars for the priests to accomplish their sacrifices: MACROBIUS, *Sat.*, iii, 4"; and speaking of the temple of Venus at Rome he adds that it "was eminently a *templum*, but as there was an area of the above description, it was also called a *delubrum*; and because it was a double building, having two aspects, two distinct cells, two areas, etc., it was called in the plural number *delubra*. It also comprised the properties of a *fanum* (it is called a *fanum* by AURELIUS VICTOR in v. *Maxent.*) and an *ædes*, but neither of these words would have been sufficient to express its dignity. *Ædes* may signify the internal edifice,—*delubrum* the open space between it and the outer colonnade; *fanum* the whole consecrated spot on which it stands; and *templum* the dignity of the inauguration." *Ædes*.

DEMETRIUS, in conjunction with Pæonius, completed about B.C. 380 the temple of Artemis at Ephesus, which had been commenced about B.C. 600, and continued, as far as the columns and entablature were concerned, by Chersiphon and Metagenes about B.C. 560, so that when STRABO, xiv, intimates that the building was enlarged by another architect, he probably means that the *peribolus*, etc., was the work of Demetrius, who is called by VITRUVIUS, vii, pref., *Servus Dianæ*, or as he would have been termed in later times a 'lay brother'. 62.

DEMOCRATES is mentioned as an architect, son of Periclytus, B.C. 331-24, in an inscription given in MURATORI, *Thes. Nov.*, fol., Milan, 1740, ii, 949: see, however, DEINOCARES.

DEMOLITION. The removal or the taking down of the materials of which a building or artificial structure of any kind is composed. Demolition differs from destruction in this respect, that in the case of the former no change necessarily takes place in the materials themselves, whereas in the latter the intimate structure of the materials is altered. A demolition may be the preliminary operation of a reconstruction; a destruction implies an entirely new construction, or the reduction of the materials to the state of a heap of ruins.

G. R. B.

The AIDE-MÉMOIRE, 8vo., London, 1846, i, 297, treats of the demolition of fortifications, towns, magazines, buildings, cisterns, bridges, barriers, etc., by means of gunpowder, with especial reference to the location and quantity of the explosive material, so as to produce the desired effect without scattering the ruins, and therefore without damage to surrounding premises.

In consequence of the objections raised upon the use of gunpowder in the demolition of the walls of old S. Paul's cathedral,







Sir C. Wren was obliged to employ the battering ram in its stead, which he found extremely effective. Gunpowder was also used at first by Mr. Tite, to destroy the foundations of the Royal Exchange; but it had to be given up, as the houses near were considered to be endangered by its use.

DEMOPHILUS, according to VITRUVIUS, vii, preface, wrote a work entitled *Precepta Symmetriarum*.

DENDERA in Egypt, see TENTRA.

DENDOUR. The modern name of a village in Nubia. This place is only remarkable for an unfinished temple of the time of the emperor Augustus; it is only 34 feet long by 20 ft. wide in the main building. Careful illustrations are given by GAU, *Antiquités de la Nubie*, fol., Paris, 1822, pl. 23-6.

DENHAM (Sir JOHN), knight of the Bath, and well known as a poet, was born in Dublin in 1615. At the Restoration in 1660 he was appointed by Charles II surveyor-general of the royal works. As surveyor-general of the works at St. Paul's cathedral, his fee being 6s. 8d. a day, he directed the repairs until the fire in 1666, and in 1668 was appointed one of the committee to pull down the dangerous portions of that structure. With John Webb as his assistant he designed the earlier portion of Burlington House, Piccadilly, commenced 1665 (Perry, *Diary*, 20 February 1664-5; 28 September 1668; given in KIR, *Britannia*); and erected the river front, of the west side of the great square of Greenwich Hospital, said to be from a design by Inigo Jones; Webb being here also assistant-surveyor (EVELYN, *Diary*, 19 Oct. 1661; 24 Jan. 1661-2). Together with Wren as deputy surveyor, they made a complete alteration of Windsor Castle, and added for the king the principal addition of that period, the Star Building (now called the Stuart Building), which is about 170 ft. long. Denham built and endowed an almshouse for five women at Egham in Surrey, and probably designed the parsonage house, it having been rebuilt as his residence by his father Sir John Denham, one of the barons of the Exchequer. He died on 19 March 1667-8, aged fifty-three, and was buried in Westminster Abbey. JEFF, *History of the Carpenter's Company*, 8vo., Lond., 1848, 182.

DENNYBALL SLATE, see DELABOLE SLATE.

DENSITY. The mass of the unity of volume of a substance. In a homogeneous body, the mass itself being proportional to the volume, it may be expressed by the formula,  $m = vd$  (in which  $m$  = the mass,  $v$  = the volume, and  $d$  = the density; and

from this is derived  $\frac{m}{v} = d$ ; in this case  $d$  is the *specific gravity* of the body under consideration. It has been agreed by the consent of all writers on physics to consider the density of water as the unity of comparison in all tables of specific gravity, excepting in the case of gases in which the density of atmospheric air is taken as the unit. When therefore the density or the specific gravity of a substance is said to be 1, 2, 3... it is understood that any volume of that substance will weigh as much as 1, 2, 3... times an equal volume of water would weigh. In the English tables distilled water at 60° is taken as the standard of comparison, and calling it 1,000 the following table is obtained according to CARR, *Synopsis of Practical Philosophy*, 16mo., London, 1842.

Platina purified	-	19,500	Cobalt cast	-	7,812
" hammered	-	20,336	Nickel "	-	7,807
Pure gold cast	-	19,258	Iron "	-	7,207
" hammered	-	19,361	" wrought	-	7,788
Mercury	-	13,568	Steel hard	-	7,816
Lead cast	-	11,352	" soft	-	7,833
Silver pure cast	-	10,474	Tin	-	7,291
" hammered	-	10,510	Zinc	-	7,190
Bismuth cast	-	9,822	Antimony cast	-	6,702
Copper	-	8,758	Tungsten	-	6,066
" wire	-	8,878	Arsenic	-	5,763
Brass cast	-	8,395	Leadstone	-	4,800
" wire	-	8,544	Molybdena	-	4,738

Glass, flint	-	3,329	Serpentine (green)	-	2,988
" white	-	2,892	Mica	-	2,900

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Glass, bottle	-	2,732	Basalt (Giant's Causeway)	-	2,864
" green	-	2,642	White marble (Parian)	-	2,837
Marble green	-	2,741	Purbeck stone	-	2,594
" red	-	2,735	Portland	-	2,570
" white Carrara	-	2,716	Mill stone	-	2,483
Porphyry red	-	2,765	Yorkshire paving	-	2,415
Alabaster (white, antique)	-	2,730	Obsidian	-	2,348
Slate	-	2,671	Porcelain	-	2,384
Rock crystal	-	2,653	Brick	-	2,000
Amorphous quartz	-	2,647	Coal, Scotch	-	1,300
Flint (white)	-	2,594	" Newcastle	-	1,270
" (black)	-	2,581	" Staffordshire	-	1,240
Sulphuric acid	-	1,840	Sea water	-	1,026
Nitrous acid	-	1,550	Filtered river water	-	1,001
Muriatic acid	-	1,194	Ice	-	930
Lignum vitæ	-	1,333	Beech	-	852
Box	-	1,328	Ash	-	845 to 600
Ebony	-	1,177	Alder	-	800
Oak just felled	-	1,113	Elm	-	800 to 600
" seasoned	-	743	Walnut	-	705
Mahogany	-	1,063 to 637	Pitch pine	-	660
Teak	-	745 to 657	Yellow "	-	657
Pear tree	-	646	Red "	-	529
Cypress	-	644	White "	-	420
Lime tree	-	604	Fir, Riga	-	753
Cedar	-	560	" Canadian	-	553
Poplar (common)	-	353	Larch	-	530

Gases, barometer 30<sup>3</sup>, thermometer 52°.

Sulphuric acid gas	-	2,265	Atmospheric air	-	1,000
Carbonic "	-	1,500	Nitrogen gas	-	0,985
Nitrous "	-	1,194	Ammoniacal gas	-	0,600
Oxygen "	-	1,103	Hydrogen	-	0,084

Atmospheric air being to water as 0.00128 to 1.00000. O. R. S.

DENTIL (Latin *denticulus*; It. *dentello*; Sp. *dentelle*; Fr. *denticule*; Ger. *kälberzahn*, *zahnschnitt*). A block, console, or corbel, used as a repeating ornament in various situations. A dentil cornice occurs as a capping to a window among the ruins of a Doric temple at Selinuntum in Sicily; see also DONALDSON, *Doorways*, 4to., London, 1833. But it is chiefly found in the bedmold of the cornice of an order belonging to a Greek, Roman, or Italian style, where it has been supposed to represent the end of a ceiling joist; the earliest existing examples being probably seen on the choragic monument of Lysicrates at Athens. Yet VITRUVIUS, iv, 2, states that as the dentil represents the end of an *asser*, while the mutule answers to the termination of a *cantherius*, no one in Greek works puts a dentil under a mutule; and, i, 2, gives free choice between dentils and mutules for his Corinthian order. The dentil, however, appears behind the mutules under the corona of the theatre of Marcellus at Rome; but, while few other antique instances occur of the use of the dentil in an order less ornamented than the Ionic, it was adopted in the Doric of Barozzi and Scamozzi: it was not introduced in the Ionic of Alberti and Scamozzi, the Corinthian of Alberti and Serlio, or the Composite of Scamozzi. In opposition to the rules laid down by VITRUVIUS, iii, 3, that the dentil's projection should equal its height, while the width should be half of the height, it is found in approved examples that the width of the face of the dentil is about equal to the real or else the apparent projection from the ground: and the diagonal of this plan gives an approach to the real or else the apparent height. In the plate DENTIL, seventeen illustrations are collected of the proportions of the mass and of the space, as well as of the undercutting in the soffit and the sinking to the back or ground, which makes the difference between the real and the apparent projection; and similar consideration ought to be given to the various methods of managing the interdental, or space between the dentils; a portion of the decoration of a cornice which deserves separate consideration.

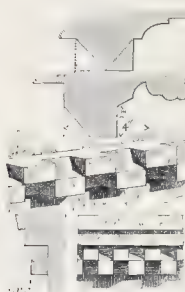
#### INTERDENTIL.

VENETIAN DENTIL is the name given by WILLIS, *Remarks*, 8vo., Cambridge, 1835, p. 196, to a molding "consisting of a fillet with its sides cut alternately into notches, which reach the middle of the face and produce the effect of a double row



of dentils"—"so great a favourite with the Venetians that it appears everywhere upon their buildings amongst the moldings, and that from the earliest ages to the latest; it is the most universal ornament in its own district that ever I met with, and is very rarely to be found out of it."

STREET, *Brick and Marble Arch.*, pp. 138, 280, states that



"originally invented by the architect of S. Mark's in order to lighten the lines of constructional stonework within which his encrusted marbles were held, it was afterwards, down to the very decline of Pointed architecture, used everywhere in Venice—not only in its original position, but as a kind of label round the arch." He regrets its use as an ornament in the later work in that city.

The name is perhaps hardly correctly assigned, as the cutting is not confined to horizontal bands.

A peculiar and effective ornamented band having the appearance of dentils, as shewn in the cut, drawn by T. H. Lewis, is seen at the cathedral, and at the churches of S. Pietro, and of Sta. Maria in Piazza, at Ancona.



DENTIL BAND (Fr. *denticule*). A square molding which derives its name from its place, the term being applied not only where the block of stone might from its amount of projection be supposed to be prepared for carving into details, but where the block has merely such a section that, if the superior moldings would permit, the band could form a ground for dentils. Thus the cornices of the Colosseum, and to the Corinthian orders of the Pantheon and of the temple to Antoninus and Faustina at Rome, as well as of the temple to Vesta at Tivoli, and of the arches of Trajan at Ancona and Benevento, are said to have dentil bands in their bedmolds; so also the Ionic order of Alberti and Scamozzi; the Corinthian of Alberti and Serlio; the Composite of Scamozzi; have the uncut dentil-band, which does not appear in the Ionic order of the temple on the Ilisus; the temple to Minerva Polias at Priene; the temple to Apollo at Basse, and the Corinthian order of the temple to Jupiter Olympius at Athens; nor in the Ionic order of Palladio; and the Corinthian of Scamozzi.

*Denticule en guiloches* is the name given by French architects to a sort of fret, being a continuous narrow band rising, returned square, and dropping, to return square and rise, which is sometimes worked upon the face of a square molding or upon a corona. Examples occur in the cornice of the door of the Maison Carrée at Nîmes, on the corona of the arch at Orange, and on the cornice of the Eglise des Maturins at Paris. 5.

DENTONE (ANTONIO) is mentioned by DIEDO and CICCONE, *Fabbriche*, fol., Venice, 1815-20, ii, 121-136, as the architect who about the end of the fifteenth century erected a doorway (given in their pl. 248-9) to the since destroyed church in the Isola di Sta. Elena at Venice.

DEO (PEDRO DE), see DIOS (PEDRO DE).

DENTRIANUS, see DETRIANUS.

DEODAR or ABIES DEODARA, the sacred Indian fir, is a native of the north-west of India affording a description of timber ranking among the highest of the class of firs, as it is clean from end to end, massive, free from knots, and so close-grained towards the outside that it is difficult to count its rings of growth, and fragrant as sandal wood. A slab has been exhibited 14 ft. 6 ins. long, 4 ft. 6 ins. wide, and 4 ins. thick, the result of about one hundred and ninety years growth; at thirty years old it would be about 26 ins. in diameter. The timber is pronounced to be well adapted for shipbuilding, and the tree is therefore being largely introduced into England for forest plantations as well as for ornamental purposes in gardens. ABIES.

DEODORIZER. Any substance which tends to destroy fetid or unpleasant smells. Air is considered to be infected, when the relative proportions of its nitrogen, oxygen, and hydrogen are not in their normal state. The choice of the deodorizer or disinfectant to be used under any particular circumstances must therefore be regulated by the composition of the air to be dealt with; but the following general rules may be considered to be of tolerably safe applicability:

1. The nitrous and the hydrochloric acids often act efficaciously in destroying ammoniacal animal exhalations.

2. The chlorides and the alkaline hypochlorides are amongst the most powerful of the deodorizers or disinfectants known. They decompose animal matters by absorbing their hydrogen.

3. The alkalies (such as ammonia, quicklime, potash, soda, etc.), act principally by neutralizing the carbonic acid and the sulphuretted hydrogen gases.

An energetic ventilation however is the most successful deodorizer; but when it is necessary to resort to more expeditious methods, as in the case of cleaning out a cesspool, the hypochlorides of lime are the most generally useful means: powdered charcoal acts in a very marked manner in arresting the ammoniacal gases which would otherwise escape. It is advisable to cover the matters removed from such places with powdered quicklime immediately; but if it be desired to deodorize a liquid giving off sulphuretted hydrogen, milk of lime (the fluid hydrate) should be used. Dwelling rooms, the wards of hospitals, etc., should be lime-whited often and carefully; and if infection be very strong in them, the chloride of lime must be liberally used. TARDIEU, *Dic. d'Hygiène publique*, 3 vols., Paris, 1852. CHARCOAL. LIME.

In a paper by G. WILSON, M.D., read at the Royal Scottish Society of Arts, on the relative value of chlorine, nitric acid, sulphurous acid, and ozone, as disinfectants, and on the best method of applying them to the destruction of contagious matters, it is stated that "ozone might be generated in apartments the air of which was vitiated by animal exhalations. The simplest process for this purpose would be the exposure of moist phosphorus to air; but an electrical machine or voltaic battery might also be used." The same paper also strongly recommends sulphurous acid as a cheap and powerful deodorizer and disinfectant: THE PRACTICAL MECHANIC'S JOURNAL, 4to., Glasgow, 1850.

A "Minute of Information" was issued in May 1857 by L. BLYTH, analytical chemist to the General Board of Health, wherein the special distinction between deodorizers and disinfectants is pointed out, as well as the best of both kinds to be employed in particular circumstances. The report made to the same Board by W. AUSTIN, on *Deodorizing and Utilizing the Sewage of Towns* (1857), is reprinted in the CIVIL ENGINEER JOURNAL, xx, 224, 284, 338. To these may be added the Reports made 1858 to the Court of Sewers for the City of London, by its medical officer H. Letheby, M.D., and its engineer W. Haywood, on sewers, their gases and ventilation.

Sir William Burnett's disinfecting fluid, or chloride of zinc, is now largely used in place of the chloride of lime. O. R. B.

DEOTISALVI, see PETRONI (DEOTISALVI DE').

DEPOSITION. In physics this word is applied to the action which takes place when liquids part with any substances they may hold either in solution or in suspension. It may be produced by gravity, as in the case of matters in suspension; by electrical decomposition, as in electrotyping; or by chemical change, as when carbonate of lime is thrown down from water holding an extra dose of carbonic acid. ELECTROTYPING. GALVANIZING.

In practical building operations, the term deposition is applied to the separation of the materials which are thrown down in a drain, pipe, or water course, or which are gradually abandoned by the waters originally holding them in suspension or in solution. The character of such a deposit depends mainly upon the velocity with which the water producing it may flow;

but to a certain extent the nature of the surface exposed to the action of the water, and the character of the extraneous matters themselves, may affect the rate or the conditions of deposition. Water, when in motion, is able to carry forward substances of greater or less weight, or of greater or less volume, according to the velocity with which it moves; and this law holds, let the nature of the channel be what it may. Thus DUBUAT, p. 99, found that the substances enumerated below were held in suspension in open channels, when the water flowed with the velocities quoted in connexion with them; and that consequently they were respectively deposited when the velocities fell short of those necessary to retain them in suspension. The velocities are those ascertained at the bed of the stream.

	Velocity per second.
Fine clay, fit for pottery - - - - -	3½ inches.
Fine sand - - - - -	6½ "
Gravel (of the Seine, from chalk, etc.), of the size of peas - - -	7½ "
Ditto, ditto, size of beans - - - - -	13 "
Sea beach, 1 inch in diameter - - - - -	25½ "
Flint stones, as large as hens' eggs - - - - -	39½ "

It must always be observed that the mean velocity of a stream may be considered to be about four-fifths of the velocity on the surface, measured on the centre line; and that the first named quantity is a mean proportional between the top and bottom velocities. Thus, in other words, fine clay will be carried forward in an open channel so long as the velocity upon the surface shall exceed 5 ins. per second; should the velocity be retarded, the clay will be gradually deposited. In pipes this law may be modified by the relative proportions of the frictional surface and of the transverse section; for those proportions may materially affect the mean velocity of the stream, which in its turn will affect the bottom velocity, or the one actually regulating the conditions of deposition of the extraneous matters in water.

DUBUAT considered that the nature of the material over which water flowed had little or no influence upon the velocity, or consequently upon the mode of deposit. Subsequent experiments, especially those of DUPUIT, have, however, shown that the greater or less degree of polish on the frictional surface of a channel has a notable influence upon the rate of flow. But the experiments of DUBUAT certainly give results in excess of those usually met with in practice, and it may therefore safely be considered that so long as velocities such as are above indicated can be maintained, the nature of the deposit will not injuriously differ from that indicated in the table above given. HYDRAULICS.

There is a peculiar form of deposition, or perhaps it would be more philosophical to say of segregation, to be observed in the separation of greasy matters from household waters, in sinks, pipes, etc. It does not appear that this separation depends essentially upon the action of gravitation: on the contrary, it may often be observed to commence at the upper surface of the liquid, and thence to proceed downwards by accretion quite as much as by deposition. In these cases some accidental nucleus is offered, and the greasy matters floating by it are arrested; similar bodies in suspension are attracted to the deposit thus commenced, with more or less energy, according to the chemical nature of the suspended matters, or to the motion prevailing in the water. The primary conditions for such deposition are, therefore, that extremely light bodies should be in suspension in comparatively still waters, and that a nucleus should be offered around which they may deposit. In this instance, as in every other one wherein deposition takes place, the tendency to deposit may be overcome by maintaining a certain degree of velocity in the motion of the fluid. But it is essential to observe that the mere specific gravity of the greasy matters contained in house waters has less influence upon the rapidity of their deposition than is the case with earthy matters in ordinary streams; and that even the temperature of the waters themselves may affect the rate of deposition to a serious extent. It follows from these considerations that those portions

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of the pipes or drains wherein house waters are likely to flow at first with elevated temperatures, should be made considerably larger than would theoretically be requisite for carrying off the liquids they are intended to receive; and also that they should be established in such wise as to allow of their being easily examined and cleansed. Precautions should at the same time be adopted to prevent the introduction of substances likely to form nuclei for the greasy matters in solution or in suspension.

The chemical deposition observable in some waters depends mainly upon the persistence, so to speak, of the composition of the waters themselves. Thus some streams contain large proportions of the bicarbonate of lime, and any circumstance which may cause the second dose of carbonic acid to separate from the lime, will leave the latter in an insoluble form; or, in fact, will cause it to deposit. The same thing occurs with silica; and the calcareous or silicious petrifying springs owe their powers of coating extraneous substances to a deposition thus produced. When iron is present in a water, however, in the form of a hydrous oxide, it is only deposited when a galvanic action of some kind is established between the water and the substances over which it flows. Such galvanic action necessarily occurs in iron pipes at the lead joints, and there the deposit from streams containing the hydrous oxide of iron will be most abundant. CLARK's softening process is an application of the chemical law with respect to the deposition of the bicarbonate of lime. In this case waters holding large quantities of the bicarbonate, a very feeble combination, are made to part with their excess of carbonic acid by adding to the water the necessary quantity of pure caustic lime. The extra dose of carbonic acid quits the bicarbonate, to form with the caustic lime a simple carbonate, leaving the original lime, together with the additional quantity, in the form of an insoluble carbonate of lime. Boiling likewise separates the carbonic acid from waters holding any of the above named bodies in solution, and it is to this fact that the 'fur', as the deposited matters are called, may be attributed. Especial attention to the removal of this fur is required; for it constitutes a species of non-conducting coat between the vessel in which the water is boiled and the water itself, of such a nature as to expose the vessel to be destroyed by the direct action of the fire. DUBUAT, *Principes d'Hydraulique*, 8vo., Paris, 1816; DUPUIT, *Traité de la Conduite, etc., des Eaux*, 4to., Paris, 1854. G. R. B.

DEPRESSED ARCH. The name given to an arch, which appears to have the central portion intentionally made lower than the top of the haunches; BRITTON, *Dict. s. v.*, p. 53, who gives illustrations from Elkstone church, Gloucestershire, and Avingdon church, Berkshire. It is only just to observe that the author adds, "these arches were probably at first perpendicular". ULMAR ARCH.

DEPRESSION. The change of level produced upon the surface of any body by a superincumbent weight. Its extent depends upon the elasticity of the body itself, and it may be either temporary or permanent. Permanent depressions, generally speaking, are prognostics of a change in molecular structure; but it by no means follows that they are indications of danger, inasmuch as the resistance of some materials is increased from the commencement of the compression of their component particles. G. R. B.

DEPRETER or DEPETER. The term, found in BREES, *Glossary*, 8vo., London, 1853, and of which the derivation is not given, for a sort of plastering made to represent stone. The work is rendered, then floated, and while soft a layer of small stones previously arranged on a board is quickly turned and forced into the last coat. This system is practised on the borders of, and in, South Wales. SPARING. STUCCO.

DERAND or DERRAND (PERE FRANÇOIS), a Lorraine Jesuit, who superseded or controlled Martel Ange in the design made for the church of S. Louis des Grands Jésuites, the maison-professe of his order, erected 1627-41, in the rue S. Antoine



at Paris. BRICE, *Nouvelle Description*, 12mo., Paris, 1725, ii, 182, states that Dérand could not construct, 1630, his dome of stone, but was obliged to finish it with plastering on a timber frame; and BLONDEL, *Arch. Fran.*, fol., Paris, 1752, ii, 46, 119, and *Cours*, 8vo., Paris, 1771, vi, 483, attributes to Dérand the faulty design of the *portail*. The edifice was illustrated in fourteen plates by Moreau. Dérand collected the ideas of De l'Orme, Jousse, and others, into the work entitled *L'Architecture des Voûtes ou l'Art des Traits et Coupe des Voûtes*, fol., Paris, 1643, in a manner that was sufficient for practice, but which, being deficient in geometrical rigour, was superseded by the essay on the same subject by FRÉZIER, and by DE LA RUE's edition, 1723, of the original work. He died 1644, aged 56, at Agde in Languedoc, according to QUATREMÈRE DE QUINCY; but 1661 aged 72, according to other authorities. 68.

DERBYSHIRE MARBLE. The carboniferous and transition limestones of the Peak district, in the county of Derby, yield a variety of dense semicrystalline materials, some of which afford sufficiently beautiful marbles. The principal varieties are known by the names of the *black*, the *encrinital*, the *coralline*, the *black*, and the *ordinary*, *bird's eye*, and the *rosewood*. They are raised in dimensions fitted for chimneypieces and ordinary decorative masonry, principally near Bakewell, and at Stoney Middleton, Wirksworth, Miller's Dale, and Ashford. Other quarries might be discovered in numerous parts of the same district. ALABASTER.

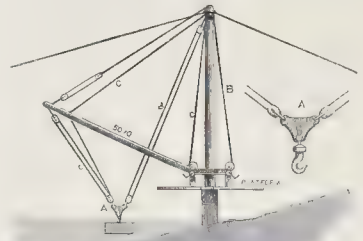
Derbyshire black marble is held in some estimation, but when obtained in large masses its brownish tinge has an unpleasant effect. The encrinital marbles often have a quaint look, on account of the sections of the numerous fossils they contain, which are usually filled in with a white crystalline carbonate of lime; but the colours of the matrices of these fossils are rarely pleasing. Indeed the general colours of the Derbyshire marbles may be described to be of a confused, indefinite, neutral character: though occasionally the encrinital varieties found near Wirksworth present a pleasant pinkish tinge over the usually light chocolate and milk coloured ground. The fluor spar of Derbyshire is occasionally worked for ornamental purposes, under the name of 'Blue John'. It, however, soon loses its polish if exposed to damp. G. R. B.

DEREHAM or DERHAM (ELIAS DE) was probably the same as Helyas de BERHAM; in addition to what is stated under that name, he is said to have superintended, 1222-35, the erection of the king's hall at Winchester, according to SMIRKE, *The Hall*, etc., in the *Proceedings of the Archaeological Institute at Winchester*, 8vo., London, 1846, who gives the quotations from rolls, etc., which furnish this name. TURNER, *Some Account*, etc., 8vo., London, 1851, pp. 176 and 183, gives an illustration of the building.

DERR, also written DAYR, DEIR, and DERRI. The capital of Nubia. It is particularly celebrated for its temple, partly rock-cut, about 110 ft. in length, apparently constructed by Ramses the Great, and illustrated by GAU, *Antiquités*, fol., Paris, 1822, pl. 50-52.

DERRICK. The special name given to a machine for hoisting; consisting of an upright pole with another secured at the bottom of it, the latter projecting forwards in the manner of the jib of a crane. An upright pole or leg, when used singly for the same purpose, is called a BY-POLE; SHEERS have two legs; and a GYN has three. The three first are necessarily upheld by guy ropes or chains, but the last stands by itself. The derrick is sometimes called a jib crane, as in the paper read at the Inst. of Civil Engineers by W. GALE, *Remarks on the Utility and Defects of the Moveable Jib Crane*, according to the construction now generally used in Glasgow, with proposed improvements to obviate its defects, given in the CIVIL ENGINEER JOURNAL, 1846, ix, 367: in xvi, 191, the American derrick is described "as being cheap and simple in construction, exact and convenient in use, and depositing the largest mass within its power at any spot within a circle equal in radius to

the boom" or jib: and in xvii, 224, Holmes's patent improved American derrick. The BUILDER JOURNAL, iii, 33-5, illustrates



the derricks in use at Granton pier, Edinburgh; at Devonport, etc.; and, 91, that at the Assize Courts, Liverpool. The jib and post have been made of tubular boiler plate by Fairbairn, CIVIL ENGINEER JOURNAL, xx, 264, and one for thirty tons at Dundee harbour, xvi, 144. WIGHTMAN, *The Moveable Derrick Crane*, in *Trans. of the Royal Scottish Society of Arts*, lxii, 8vo., Edinburgh, 1844. HOIST.

BISHOP'S PATENT FLOATING DERRICK has been of great service in America; the first one in this country was floated 25 Sept. 1858; the length is 257 ft. over all, breadth 90 ft., depth 14 ft., height from deck to boom 80 ft., radius of boom 60 ft., hoisting power above the surface of the water, 1000 tons: *Times newspaper*, Sept. 28, 1858; and ILLUSTRATED NEWS OF THE WORLD.

In addition to the works named under CRANE (Fr. *grue*, *grue à poinçon*, *gruau*, *écoperche*; Ger. *krahn*, *tummelbaum*), various forms of hoists will be found in ECK, *Recueil de Machines*, fol., Liège, 1840; ROMBERG, *Zimmer Baukunst*, 4to., Leipzig, 1850, pl. 140-51; STRICKLAND, *Reports on Canals*, etc., fol., Phil., 1826, pl. 57-9; GLYNN, *Cranes and Machinery for Heavy Weights*, 8vo., London, 1849; and wharf cranes to lift two and ten tons, in *Papers of Corps of Royal Engineers*, iv, 221. A circular coking crane is given in the CIVIL ENGINEER JOURNAL, xvii, 15; which also, xiii, 204, details the invention of cranes worked by hydraulic pressure; xvi, 389, describes that at Great Grimsby; xvii, 444, gives Fairbairn's improved steam travelling crane; and xx, 177, shows the application of cranes or derricks to pillars in buildings, as used extensively in the new warehouse at Camden Town belonging to the North Western Railway Company.

DERVISH BUILDINGS. The establishment, one story high, belonging to the Mevlivi dervishes in Pera, comprises the following buildings: the college or convent, containing the *sima 'a khaneh* or room for the dancing and singing dervishes, with the cells of the Fakirs on the west side; its chapel, generally sepulchral; the *dar-ul-hadiith* or house for instruction in sacred traditions; the school; and the hospital.

DESA. The term used in Malabar for a number of detached houses surrounded by gardens; BUCHANAN, *Mysore*, 4to., London, 1807, ii, 353.

DESARGUES (GIRARD) of Lyons, is mentioned twice by SAUVAL, *Histoire*, fol., Paris, 1724, iii, 2, 3, as the designer of the entrance, etc., to the house of the Sieur Aubri, in rue des Bernardins at Paris; and of the staircase to the hôtel de l'Hôpital, which he says is "de la nouvelle manière de Desargues." The great staircase of the palais royale, as formerly executed from his drawings, is highly praised by BLONDEL, *Arch. Fran.*, fol., Paris, 1752, iii, 41-2. Desargues designed a house in the rue de Cléry, and published through Abraham de Bosse several *Manières Universelles*, i. e. a *Pratique du trait à preuve pour la coupe des pierres*, 8vo., Paris, 1648 (which was severely criticized, as by COURABELLE, *Examen*, 4to., Paris, 1644); one of making dials; and one of *Perspective*, 8vo., Paris, 1648.

DESBROSSES, see BROSSÉ (JACQUES DE).

DESGODETZ (ANTOINE), born November 1653 at Paris, was sent, through recommendations to Colbert, at the royal expense to Italy in September 1674. Travelling with Aviler and Vaillant, they were kept sixteen months at Algiers, but were exchanged 1676 for twenty-three Turks, by order of Louis XIV. After passing sixteen months in Rome, Desgodetz returned 1678 to Paris, and published the *Édifices Antiques de Rome*, fol., Paris, 1682, republished 1779; translated by MARSHALL, fol., London, 1771, and 1795; and by C. TAYLOR, fol., London, 1848; and edited by FEA, fol., Rome, 1822; where also appeared the *Aggiunte e Correzioni* by VALADIER, fol., 1843. MOREAU published a sort of supplement, *Fragmens*, etc., 4to., Paris, 1779. In 1680 he became contrôleur des bâtimens du roi at Chambord; in 1694 was appointed to the same post for the division of Paris; was elected a member of the Academy of Architecture; and was made honorary member of the Academy of Sculpture and Painting. In 1699 he received the brevet of architecte du roi, with a pension of 2000 livres; and in 1719 he succeeded De la Hire as professor in the academy. Parts of his lectures were published, such as *Loix des Bâtimens*, which with the notes by Goupy, 8vo., Paris, 1788, became so standard a law-book that the new *Loix* by LEFAGE, 8vo., Paris, 1847, is called *le nouveau Desgodetz*; and other *Traité*s, as *Des Ordres d'Architecture*, n. d.; *De la Construction des Dômes, des Églises, des Palais*; *De la Decoration*; *Du Toist*; and *De l'Ordre François*. He died suddenly 20 May 1728. LAMBERT, *Hist. Litt.*, 4to., Paris, 1751, iii, 125; BLONDEL, *Cours*, 8vo., Paris, 1771, iii, 205, v, 439, vi, 482. The best memoir of Desgodetz, with a list of his essays, is given by QUATREMÈRE DE QUINCY, *Dict. s. n.* A folio volume, in manuscript, in the collection of the Royal Institute of British Architects, is entitled *Cours d'Architecture, dicté par M. Desgodetz, architecte du Roy*; it was presented to T. L. Donaldson by M. Guenepin in 1842.

DESGODETZ (BABUTY), sometimes mistaken for the above, is only known as the writer, with Lecamus de Mezières, of a *Dissertation de la Compagnie des Architectes experts—des gros bois de Charpente*, 8vo., Paris, 1763, useful for its remarks on the subject of DECAY.

DESGOTS or DESGODS (FRANÇOIS) a nephew of Le Nôtre, became architecte du roi. He appears to have been the first who occupied himself with gardening as a branch of his profession. The garden of the Palais Royale at Paris was laid out 1730 by him. BLONDEL, *Cours*, 8vo., Paris, 1771, iv, 3, vi, 483; *Arch. Fran.*, i, 45, 238, iii, 33, places him on a level with Le Nôtre, and intimates that after the death of "Des Gots" the relation between the house and its garden, etc., was not so skilfully treated. Desgots appears from the register of the Academy of Architecture to have been elected 1717, and to have died 1732.

DESHÔTELS (PIERRE), in consequence of his great age, was succeeded 25 October 1557 by Bullant as contrôleur des bâtimens du roi, according to the letters patent of that date, in the *Bibliothèque Impériale*, suppl. 128, vol. 264; CALLET, *Notice*, 8vo., Paris, 1843, p. 7.

DESICCATION. The operation of removing from any substance the moisture contained in it. This may be effected by means of the ordinary atmosphere; or else by means of heat, either applied in drying closets wherein the air is frequently changed, or in stoves wherein the air is kept stagnant. When, however, desiccation takes place at a very great heat, it assumes the character of calcination. The subjoined remarks are confined to the consideration of the operations employed on the ordinary materials used in building.

Stones when newly raised contain variable proportions of moisture, or *quarry damp* as it is called by workmen, which may under certain circumstances produce disastrous results in a building. The desiccation of this class of materials must, however, from their cumbrous nature, be effected in the simplest possible manner: namely by merely exposing the stones

to the open air, observing as far as possible to place them in positions wherein the air circulates freely in every direction, and where they may be protected from rain, and also frost. The *BAUZEITUNG* for 1837, p. 51, mentions the mode adopted for drying the stone to be used in building the new palace in Munich. Timber and deals are also for the most part desiccated, or as it is called seasoned, in the same manner; which, indeed, seems to be the most conducive to the durability of woods. But as the rate of evaporation in the open air is materially affected by the variations of the temperature and of the hygrometric conditions of the atmosphere, and as it naturally requires a long period of time, even under the most advantageous circumstances, it is an object with builders to dry the wood they employ by some artificial method.

There are two principal and distinctly marked modes of producing artificial desiccation; in the first, heated air is introduced from the exterior at one side or end, and the saturated air is withdrawn from the opposite one; in the second, the heat is applied directly, or in the midst of the articles it is desired to dry. Unquestionably the former of these methods is the more philosophically correct and the more economical, because the heat is more regularly and evenly diffused when a uniformly heated current of air is made to permeate the substances to be dried, than when a fire is made in a particular spot in the midst of them; and, moreover, it is far more easy to regulate the production of the heat in the former case than in the latter, because the stoke-hole and flues are more accessible. In both systems, however, the proportions of the various parts of the machinery must be regulated, firstly, by the average temperature of the locality, and by its hygrometric conditions; secondly, by the amount of moisture contained in the substances to be dried; and thirdly, by the rate of evaporation which can be safely applied to them.

The latter consideration does not appear to have been attended to with sufficient care by those who generally conduct the artificial desiccation of woods; and it is perhaps for this reason that the process itself continues to be unfavourably regarded in comparison with "natural seasoning". The timber to be artificially dried is generally exposed to a great heat for a short time, rather than to a moderate heat for a lengthened one; and the air, saturated with the vapour thus produced, is generally very imperfectly removed. Wood so treated is almost sure to split, from the unequal contraction to which it is exposed; and the pores are also very likely to reopen on the wood being withdrawn from the stove, because there is no gradual and permanent change in their mechanical structure. Thus all the attempts hitherto made to supersede the natural mode of drying timber have been accompanied by a deterioration in the quality of the timber so treated. The desiccation produced by the direct use of superheated steam seems to be particularly objectionable on this account. The *desiccating process* is well defined by DAVISON, in a paper read before the British Association, September 1849, given in the *CIVIL ENGINEER Journal*, xii, 310; with other remarks by him, x, 185. The subject is also fully considered in *Detached Essays, DRYING CLOSETS; and BATHS AND WASHHOUSES*. PECKET, *Traité de la Chaleur considérée dans ses Applications*, 2 vols., 4to., Paris, 1844. KILN. SEASONING. G. R. B.

DESIGN. This term has more than one signification. The most common preserves the true meaning of the word, viz. an indication; in this sense it corresponds to the Fr. *dessin*, It. *disegno* (in the words *école de dessin, scuola di disegno*, which mean a school for tuition in drawing, not in invention; great mistakes, however, occur in amateur renderings of these words; thus throughout the translation of VASARI, *Lives*, 8vo., London, 1850, he is made to utter nonsense, by a confused adaptation of the words invention, design, and drawing, to the original *disegno*. This may account for the omission in official use of the words which have served their purpose, 'school of design'. The notion prevalent at the establishment of such



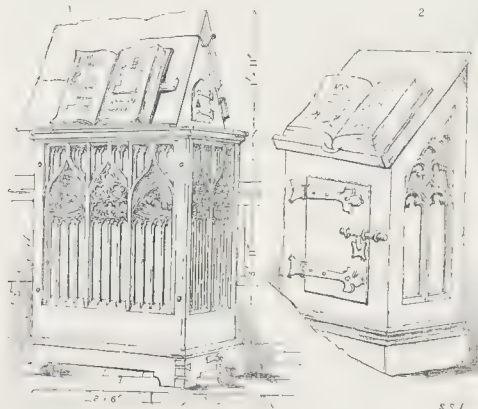
institutions is always that *invention* is the object; and this gives the second meaning of the term design, viz. a drawing illustrative of an idea, where it answers to the Fr. *projet*, It. *progetto*. Much damage to the pecuniary interest of artists has arisen from this confusion of meanings, for a person often considers himself injured in having to pay more for one design (a drawing of a notion) than for another design, as he often calls it (a drawing copied from the former). The third meaning of the word design is that which is accepted by artists; the idea or invention itself, Fr. *idée*, *invention*, It. *idea*, of combinations of known parts to answer the purpose of a given subject.

The *elements of design*, in the latter sense, form the subject of a chapter in VITRUVIUS, which has been commented at length by Pocock in the *Detached Essays*, and are also the foundation of the work by PUGIN, *True Principles of Pointed Architecture*, 4to., Oscott, 1841.

**DESK.** A small table, generally a slab, made sloping for the use of writers and readers, sometimes having a box or a drawer under it.

**BANKER'S DESKS.** In addition to those fixed on the counter, and used by the cashiers as pay desks (COUNTER), there are others, single or in ranges, for the 'pass-book clerks', 'bill clerks', 'posting clerks', etc. They are generally supported on pedestals about 18 ins. wide, 2 ft. deep, and 3 ft. high, placed about 2 ft. 6 ins. apart, containing nests of drawers; the desk being 2 ft. 9 ins. from back to front, including the 'rest' for books, rulers, etc., and having a 'well' and small drawers within it; the whole being made of wainscot or mahogany. J. T.

Desks, forming book closets as well, designed by M. A. Buonarroti for the Laurentian library at Florence, are given in the plate FURNITURE, from drawings by S. Smirke, A.R.A. The



accompanying woodcuts, from drawings by S. Salter, jun.,



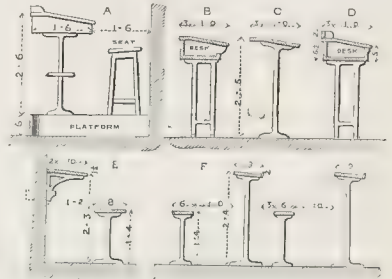
3, illustrate similar examples; fig. 1, in the church of S. Laurence, Nuremberg; fig. 2, in relief, in a panel in the church of S. Colomba at Cologne; and fig. 3, also in relief, in the Sacrament house at Frankfurt. LECTERN.

A design for an architect's desk, by LAMB, is given in LONDON, *Arch. Mag.*, 8vo., London, 1838, v. 262.

"At the Reformation, the churchwardens were ordered to set up a desk of wood without the choir door, in which morning and evening service were to be said in English; and pulpits also were to be placed for the preachers", as settled by the com-

missioners for ecclesiastical affairs in the reign of Elizabeth; CLARKSON, *Hist., etc., of Richmond*, 4to., London, 1821, p. 147.

The desk in school-rooms forms an essential portion of the



fittings. Those recommended for the National Schools are shewn in figs. A, B, C, and D, and for the Lancasterian system, in figs. E and F. Further details will be found in the *Minutes of the Committee of Council on Education*, part 2, 1839-40. The seats and desks in the school-room at Winchester college are formed by ranges of oak benches; on them are placed boxes 25 ins. long, 12 ins. deep, and 18 ins. wide; the upper lid being raised as a shelter, a second cover serves the purpose of a desk, while below it are kept books and implements for writing. The long tables of a dining-hall occasionally used as a class-room, have been constructed so as to serve as desks, having hinged tops with two sets of swing brackets, one level, the other sloping.

**DESSAISON (PIERRE)**, born about 1713 at Paris, erected 1733 a house at the corner of the rues des Petits Champs and de la Vrillière; for the chapter of S. Honoré he designed their large building in the former street; and was much employed not only at the Grands Augustins, but on very many restorations or decorations of houses in Paris and in the country. In 1747 he designed the *portail* of the church of the Theatins, given in BLONDEL, *Arch. Fran.*, fol., Paris, 1752, i. 291; and was elected 1762 a member of the Academy of Architecture. He became chevalier of the order of S. Michael. The date of his death is not known.

**DESSAULBEAUX (PIERRE)** is mentioned as one of the artists engaged on the great works at Rouen and in its neighbourhood, during the reign of Louis XII; AICARD, *Patria*, 8vo., Paris, 1847, p. 2162.

**DESTINA.** A word on which there has been much controversy. It occurs twice in VITRUVIUS, v. 12, who says that a coffer dam, *arca*, should be formed of piles, *stipites*, fastened with chain-ties, *catene*, filled in with waling boards, *trans-tella*, and stuffed with a sort of hydraulic concrete made of pozzolano; this is for smooth water. But if the waves of the sea break on the work, and the *destinae arcae* will not stand, then another course is to be pursued. Now as some manuscripts read 'destinate', and as the meaning of 'destine' was not clear, that reading was adopted, and the translation was then considered to be "if the coffer dam which had been fixed would not stand," etc. But shortly after, VITRUVIUS, shewing how to construct a coffer dam from which the water is to be pumped, and in which piers of masonry are to be carried up, directs a double coffer dam to be made and stuffed with a puddle of clay mixed with seaweed, *inter destinas*. Now here it is clear that *destinatas* will not do: the word is evidently a substantive. ARNOBIUS (*Adver. Gentes*), where ridiculing the Heathen notion of Atlas carrying the world on his shoulders, says "Atlas that prop", *tibicen* (as in JUVENAL, *Sat.* iii. 163, where it means a shore put to keep up a crazy house) that 'destina' of heaven. Another passage is in an obscure author, CORIPPUS AFRICANUS (*Laudes Justinii*, i), wherein he designates that emperor as the support, *destina*, of Libya. From all these circumstances, it seems pretty clear that VITRUVIUS means by the word *destina* each main pile of a coffer dam.

DESTINA is used as equivalent to *furca, domus fulcras*, in PAPIAS, in MS. Bituric; and occurs as equivalent to *apostata* "quæ extrinsecus ecclesiæ pro munimine erat adposita", BEDE, *Hist. Eccles.*, iii, 17, quoted in the *ECCLESIOLOGIST Journal*, 1849, ix, 24, in which place it seems to mean a shore, being clearly of timber. It has also been used to designate the aisle of a church, and also a cell, as by OSBORN, in v. S. Dunstani, in *Acta Sancti*, May, iv, 363.

DESTOUCHE or DESTOUCHES (LOUIS NICOLAS MARIE), born 1787 at Paris, a pupil of Percier, gained 1811 the prix départementale, 1814 the grand prix of the Institut, and 1829 was the successful competitor for the general arrangement of the decorations of the place Louis XVI. He designed 1826 the house No. 2 at the corner of the place de la Madeleine and the rue Tronchet, and 1832 the house No. 11 rue du Bac, which are given in NORMAND, *Paris Moderne*, 4to., Paris, 1837, i, 6-10, 123-5. He was architect to the école vétérinaire and museum of natural history at Alfort. 110.

DESTOUCHES ( . . . ), entitled *ancien architecte de la ville de Paris*, made a design, highly praised by BLONDEL, *Cours*, 8vo., Paris, ii, 321, for the church of Ste. Geneviève in that city. He, as well as Servandoni, made a design for a place in front of the portico of the Louvre; and, as well as Servandoni (though not members of the Academy of Architecture), was allowed 1748 to submit a design for the place Louis XV. PATTE, *Monumens*, fol., Paris, 1767, p. 121, 197.

DESTRARIA. A late Latin term equivalent to deambulatory. 80.

DESTRUCTION. The so-called "destructive action of time" is but a periphrase to express that the chemical decompositions of building materials have been allowed to develop themselves unchecked. But correctly the term destruction is applied when the structural arrangement of a substance is so essentially modified as to cause it to assume new forms. Thus combustion, whether slow or quick, by fire or by the gradual absorption of oxygen, destroys metals, woods, and animal substances; and again, the new salts which are occasionally formed in stones, limes, bricks, etc., will eventually destroy those materials. DECAY. INSECTS. WORMS. G. R. B.

DETAIL. The term, adopted from the French word *détailleur*, for each portion, taken separately, of a building; and for each subordinate member of that portion: thus a window is part of the general detail, while each of its moldings, etc., is a portion of the particular detail, of the structure. The general details, without constituting the essential merit of a composition, add in a high degree to its perfection, if they are well chosen and judiciously employed: so much is this the case that the spectator regards the larger details more frequently than the general qualities of the work; and is often found to be so captivated by those particular portions as to pronounce, on their evidence, a decision as to the merits of the design. It has been very well observed by QUATREMÈRE DE QUINCY, *Dict. s. v.*, that many edifices would gain estimation if they could lose their faults (especially that of superfluity) of detail. The general question is, as above shown, one of extreme importance, yet the student has no concise guide as to the principles on which to found his choice of detail. Nor is he supplied with any special collection of facts exhibiting (with regard to given dimensions usual as well as exceptional), the normal size of each member of his detail, the limits within which such member may be successfully enlarged or diminished, the average quantity of detail to be employed, and the proprieties to be considered in the scale adopted for sculptural decoration. Whoever may take up these subjects, hitherto almost untouched, will at once perceive that one of the most important and most frequently cited dicta expressed by PUGIN, *True Principles*, 4to., Oscott, 1841, p. 63, may be confuted by a partial selection of authorities, because the opinion itself is founded on such a base. He intimates that "in Pointed architecture the different details of the

edifice are multiplied with the increased scale of the building: in classic architecture they are only magnified,—there are the same number of diameters, the same number of moldings, the same relative projections;" and a very ingenious deduction is derived from the effect of the buildings which he cites as examples, viz., Cologne cathedral, and S. Peter's, as well as a lesson on the scale to be given to figures that are introduced as accessories to architectural composition. This author has evidently not fully explored the grounds for his dictum; or he would have found that the best practitioners worked in the one period upon principles, with regard to their details and accessories, very similar to those followed in the other; but these principles differ entirely from the corollaries of his proposition.

DETERIORATION. The state of any substance when its quality is made worse, or of less value. Substances, which are susceptible of natural decay, or destruction, deteriorate spontaneously; and they must, therefore, be protected against the causes likely to superinduce those conditions. It is on this account that protecting coats are applied to some descriptions of building materials, and that all of them require to be used with precaution. ATMOSPHERIC INFLUENCE; DECAY; DECOMPOSITION; PRESERVATION OF MATERIALS, etc. G. R. B.

DETERMA. A rather hard, but not very close or even-grained, wood from the river Demerara, British Guiana. It is the most valuable wood of the locality for ship building purposes, being used chiefly for the bottoms of vessels, as well as for masts and planking for colonial craft. As insects do not attack this wood, it is well adapted for furniture. As timber it will square from 14 to 16 ins., in lengths from 40 to 60 ft. 71.

DETOURNELLE (ATHANASE) born at Paris 1766; published *Charpente de P. de l'Orme*, fol., 1800; *Funérailles*, 8vo., 1801; *Journal d'Architecture*, etc., 1800, etc.; *Nouveau Vignole*, 20 pl., 4to., 1804; *Recueil d'Arch.* . . . *Tombeaux, Arcs de Triomphe, Fontaines*, etc., 102 pl., fol., 1805, and 1807; and, in continuation of the series commenced by Prieur, *Projets d'Arch.* . . . *qui ont mérités les grands prix*, 120 pl., fol., 1806, the third and fourth series were published by Vaudoyer and Baltard. He died in 1807. VICTOR, probably his son, born at Paris 1793, died soon after 1835.

DETRIANUS, called Decrianus by GRUTER; Demetrianus by CASAUBON; and Dentrianus by SALMASIUS; has been considered, by many writers, the architect of all the great works described as the undertakings of the emperor Hadrian by SPARTIAN in v, 19; but the passage only specifically attributes to Detrianus the removal of the colossal statue of Nero.

DETRITUS. A term used in practical geology to express the minute portions of a rock, or deposit, which may have been detached and removed to a distance by the action of any abrading and transporting power. Thus, when a river flows over an easily detached stratum, or when the rainfall of a district is able to remove the particles of a rock and to transport them to a lower level, those particles are said to constitute the *detritus* of such rocks in contradistinction to the *débris* which remain nearly where they fell. The detritus furnished by the destruction of older formations furnish, indeed, the elements of all alluvial and diluvial deposits, to whatsoever geological period they may belong. DÉBRIS. G. R. B.

DETRUSION. The action of any force to thrust outwards a body exposed to its influence, as in the case of an embankment behind a retaining wall, or of an arch or truss acting upon a pier, or other point of support, intended to receive the effort tending to overthrow it. The stability of a structure under an effort of detrusion depends entirely upon the fact of the momentum of the resistance of the structure itself (from whatsoever cause arising), exceeding the dynamical effort exercised by the overthrowing force; the conditions of these respective actions will be found described under STABILITY. As nearly as possible, the word 'detrusion' is synonymous with the expression 'outward thrust,' and in most cases it may be very conveniently substituted for that expression; the only logical



distinction between the two being that an 'outward thrust' may exist without any necessary separation between the body thrusting and the body thrust; whilst "an action of detrusion" implies that one of the bodies concerned is thrust violently away from the other, in such manner as to ensure a perfect separation.

G. R. B.

DEUS TAMBEN or TAMBER, see DIOS (PEDRO DE).

DEVENTER. A city in the province of Over Yssel in Holland. The large and interesting early Gothic church, cathedral from 1559-95, and dedicated to S. Lebuin, with its handsome tower and crypt, and some good glass, is the chief object of architectural interest besides the large town hall, the court-house, the prison, and the weigh house; five places of worship, with seven hospitals and asylums, being hardly worthy of notice.

DEVISOR. The post of "devisor of buildings" was the last in rank, because perhaps the latest established, but was one of the four best remunerated, of the officers named in the list of appointments in the royal household; the earliest known of these lists is of the period of king Edward IV, 1461-83, and the latest is dated 1628. In all the lists the salary is stated to be £36:10:0 per annum. BRITTON and BRAXLEY, *History, etc., of Westminster*, 8vo., London, 1836, p. 314, observe "it appears from the Patent Rolls, that in the sixteenth of Henry VI (1438) John Golding was made chief carpenter, and *disposer*, and surveyor of the king's works in the palace of Westminster, and at the Tower of London, with a yearly fee of £20; and that in his twenty-third year, John Whattley was appointed to the same offices." John of Padua is called 'devisor' in a patent dated 1544, and he is believed to be the only one whose name has been met with, having that title appended.

DEVITRIFICATION. A peculiar change which takes place in GLASS, in consequence of the action arising from the alkalis which enter into its composition. The surface of the glass becomes dull and earthy, and the mass loses its clear transparency, assuming at times a species of opaque iridescence; the structure becomes more fibrous and less brittle than ordinary glass. The less fusible varieties of glass, and those which are long exposed to ammoniacal fumes, as in windows of badly ventilated stables, are the most liable to this change. At a meeting of the British Association in 1858, Dr. BINGLEY read a paper "on the effects produced on glass by exposure to the action of mud in water", which is given in the *BUILDER Journal*, xvi, 697. The mud contained a large quantity of organic matter and sulphide of hydrogen. On scraping the glass the coloured part was easily detached, and the glass underneath appeared as if it had been ground. Various chemical actions had taken place, decomposing the glass; assisting to verify the long known fact that water acts more or less on glass, slowly decomposing it into a soluble alkaline silicate. EBELMAN has noticed at some length the action of water charged with carbonic acid on this material. The glass viewed by transmitted light exhibited rays of colour complementary to the reflected rays. DECOMPOSITION.

G. R. B.

An apparent devitrification might be supposed to exist in many escutcheons, formed by stained and painted glass, which have lost their colour: thus the author of the *Harleian MS.* 6829, fol. 287, says, in allusion to the herald's rule to avoid placing any charge of metal upon a field of metal, and any charge of colour upon a field of colour, "where in windows I fynde or in *argent*, I beleave it is but a decay of the colour *gules*." It must be noted, however, that there are colours which fly, or lose the colouring matter; not that their substance is lost, but that it seems to undergo some alteration of structure; whether this alteration be not in reality, however, a kind of combustion is considered to some extent, *s. v.* DECAY.

DEVONSHIRE MARBLE. The carboniferous limestones of South Devonshire, near Chudleigh, Holcomb Rogus, and Westleigh, yield a common marble of a greyish tint; and near Brent Tor, in the neighbourhood of Tavistock, the same

formation yields a red jasper which can occasionally be raised in blocks of considerable dimensions. Near Plymouth and Babicombe Bay, the limestones of the grauwacke series yield marbles which are much esteemed locally, and are largely quarried for ornamental masonry purposes. The colours are, generally speaking, varieties of grey, with veins of white, and occasionally streaks of pink; whilst in some localities red and yellow marbles of great beauty are to be found. In many cases the remains of fossil corals are so numerous as to justify the application of the name, under which they are often known, of the *madrepore marbles*. DELABECHE, *Geology of Cornwall, Devon, and West Somerset*, 8vo. London, 1839, describes a green marble as occurring near Kitley Park; and states that the rose-coloured dolomite, from the same neighbourhood, is a very handsome, though hitherto neglected, material. G. R. B.

DE WAILLY, see WAILLY (CHARLES DE).

DEWEZ, or DE WEZ (LAURENT BÉNOÎT), was born 1731 at Rechain in Limbourg. He studied at Rome under Van Viteili; visited Greece, Naples, Lisbon, Paris, London, Stockholm, and Copenhagen; and having obtained the brevet of architect to the king of Portugal, established himself 1760 at Bruxelles, where he was appointed premier-architect to the archduke Charles of Lorraine. Among his leading works may be enumerated the chateau Charles built 1760 for the archduke at Tervuren (demolished 1783); at Bruxelles, the *salle du dais*, perhaps also the great staircase, and the interior decorations (which are attributed to Folte) of the *ancienne cour*, now the *musée*; the *façade* 1771 of the *hôtel Granvelle*, Roose, or Coloma, for the *conseils privés et de finances*, now the *palais de l'université*; and the *salle du concert* noble in the *hôtel de Romeswal*; the Doric column, 100 ft. high, forming a light-house at Ostend 1771-2; the *maison-de-force* at Vilvorde 1776; the Cistercian abbey and church at Orval in Luxembourg (his *chef d'œuvre*) blown up 1793; the Benedictine abbey at Vlierbeeck near Louvain, and its church, circular on plan, with Corinthian columns 30 ft. high and a dome, finished 1790; and another with its church at Gembloux nine miles from Namur; the Premonstratensian abbeys and their churches at Bonne Espérance near Binche, illustrated by GOETGHEBUER, *Choix*, fol., Ghent, 1827, pl. 38-9; and at Heylissem six miles from Tirlemont; the abbey at Affligem, where he modernized the church; the abbey of S. Martin, afterwards the *hôtel-de-ville*, at Tournai; the Cistercian abbeys for nuns at Valduc and at Florival near Louvain; the churches, formerly collegiate, at Harlebeeck three miles from Courtrai, and at Ardenne nine miles from Namur; the chateau de Bruzelette near Ath, in Hainaut, and the chateau de Seneffe six miles from Nivelles built 1760, given in GOETGHEBUER, pl. 40-41, and specially described as the finest in Belgium by TYBERCHAMPS, *Notice des principaux châteaux*, etc. The preceding notice is condensed from the memoir by SCHAYES in the *Messenger des Sciences*, etc., 8vo., Gand, 1833, i, 449-54, which gives short critical notices of some of these buildings.

Dewez, according to GOETGHEBUER, also restored or rather modernized the abbey and church at Floreffe and at S. Hubert; is said to have enlarged the abbey of S. Pierre at Gand, to have erected those at Forêt and at Herkenrode; the churches of S. Gérard at Namur, S. Pierre near Bruxelles, at Parcq, and at Ucle; the *façade* of the abbey at Villers; the châteaux at Boulez, Wasseige, Emserure, and Attre; Bellevue ten miles from Bruxelles; another near les Trois Fontaines; a country house at Chapelle near Bruxelles; the anatomical theatre, *fecun*, and botanic garden at Louvain; the abbatial library at S. Trond and at Hasselt; the priory at Airemont near Mons; the *hôtel d'Exchernin* at Prague; and the hospital at Bouillon: besides restoring the *hôtels de ville* at Ostend and at Binch, and the chateau de Marimont. COMMISSION ROYALE D'HISTOIRE, *Compte Rendu des Bulletins*, 8vo., Brussels, 1849, xv, 207.

Dewez thus rapidly acquired a fortune sufficient to purchase the seigneuries of Steen, Altwort or Atewort, and Over-

beeck; and on the loss of his government works, he retired 1778 to the chateau which he had built for himself at Steen. He subsequently resided at Bruxelles, where he died 1812, having seen the destruction of many of his structures, which had given him the reputation of regenerating art in Belgium, and of being the first architect of his time and in the country.

DEXIPHANES, also called DEXIOPHANES (of Cyprus, but this seems to be a mistake for) Cnidos, is mentioned as the architect of a causeway styled tetrastadium and heptastadium, joining the island Pharos to Alexandria, and the tower Pharos itself is sometimes added in the following works which give these constructions to the reign of the celebrated Cleopatra, B.C. 51-28; *Chronicon Paschale*, fol., Paris, 1648, p. 192; TZETZES, *Chiliades*, 8vo., Leipsic, 1826, ii, 26; iv, 502; vi, 294; CEDRENNUS, *Compendium*, fol., Basle, 1566, p. 142; and AMMIANUS MARCELLINUS, *Hist.*, 8vo., Leipsic, 1808, xxii, 16; but VALESIUS commenting thereon says that these were only repairs; while VOSSIUS in the notes to POMPONIUS MELA, *De Situ Orbis*, 8vo., Franeker, 1700, ii, 7, suggests that Cleopatra only completed the causeway and did nothing to the tower. On the contrary, CÆSAR, *De Bello Civili*, iii, 112; and JOSEPHUS, *Antiq.*, xii, 2, speak of the causeway as having been constructed under earlier sovereigns; and the tower is generally attributed to the skill of SOSTRATUS.

DEYS, see DAIS.

DHAGOBAB, see DAGOBA.

DHANNEE. A dark-coloured wood of Travancore, East Indies; it is very strong, but knotty, and therefore only used for common buildings. 71.

D'HARCOURT'S PATENT ARTIFICIAL GRANITE AND MARBLE is said to consist of, say, one ton of resin, linseed oil or tallow from one to eight pounds in weight, two tons of chalk or whiting, and ten pounds of some fine fibrous material; these are incorporated in a melting pot with eighteen or even twenty-four tons of perfectly dry sand. This preparation was intended to serve for pavements, and by a variation of materials, for artificial marbles; as further described by DONALDSON in the *Encyc. Metrop.* 1845, xii, 172, s. v. Stucco.

DHARMAPATAN, in Nepal, see BHATGONG.

DHARMA SALA, or DHERMSALA. The name given in Hindostan to a resting place, whether on the road, or within the precincts of an establishment, which serves to receive pilgrims, mendicants, or other travellers.

DHAY-NAIN, in Persia, see SIN-SIN.

DHEYRI. The native name of a strong and good timber, obtained from the *Taxus virgata*, a tree which grows to a large size in Nepal. 71.

DHOOMNAR or DHUMNA. The name of a hill in the province of Malwa, in Hindostan. The rock, consisting of laterite or ironstone, pierced by numerous cave temples, is described in very opposite terms by TOD, *Annals*, 4to., London, 1829, ii, 725, and by FERGUSON, *Rock-cut Temples*, 8vo., London, 1845, p. 41. The caves form a series of the most diminutive temples in Hindostan; one has a dagoba in the open air in front (the area may have been at one time covered); another is a "combination of a chaitya-cave with a vihara cave, which I never saw before," according to FERGUSON, who considers that the date of the caves generally is comparatively recent; and that there has been an area excavated around part of the rock which thus, like the KYLAS at Ellora, is a model of a Brahmanical structural temple, and may be supposed, from its resemblance to the temple at Barolli, to date about 800-850 A.D.

DIACONIA or DIACONIUM. An hospitium or spital attached to a church for the relief of the poor or infirm, according to MORONI, *Diz. s. v.*, who explains it with special reference to accounts of the early Christian church; but the term appears to be preserved in modern use in Germany. An anchorage in a church is called diaconia by ROMÉLOT, *Desc., etc., de Bourges*, 8vo., Bourges, p. 221. ANCHORAGE.

DIACONICUM. This term, which occupies an important ARCH. PUB. SOC.

place in the descriptions of early Christian churches and their appendages, expressed a SACRISTY, according to BINGHAM, *Origines*, 8vo., London, 1840, ii., 450-476, who intimates that it was also named secretarium; calls it mutatorium, rectorium, and saluatorium; and concludes that it formed a part of the pastophorium, being not necessarily in, nor always attached to, the fabric of a church; that it might be, or might contain, a sceuophylacium; and that the building appears to have been large enough in some cases to receive, not only a private consistory, but a provincial or general council. Hence he terms it diaconicum magnum, in opposition to the smaller one, diaconicum bematic, properly the sceuophylacium, i.e. repository for the sacred utensils, vessels, and vestments, when brought out of the greater diaconicum to be in readiness for divine service; he also shows that it served as an oratory, and decides that its place was on the left hand looking from the altar. Hence evidently it is the correct name for a small space in that locality. Diaconicum might also serve to express the whole space across a church, either immediately in front, looking from the altar, or else right and left of the martyrium in the space corresponding to the nave, which was the special place for the deacons, and was the velum altaris, according to the doubtful authority of the passages collected to this effect by DUCANGE, *Comm. in Paul Silent*, 581-95. MORONI, *Diz. s. v.*, calls it conclave, metatorium, sacrarium, secretarium, and saluatorium, answering in many respects to the modern sacristy; adds to the above explanation that it was also the name for the seat of the cardinal deacons to the right and left of that of the pontiff; and cites S. PAULINUS, *Ep.*, xii, ad Sev., 8vo., Antwerp, 1622, p. 152-4, to prove that a church had two diaconia or diaconica, one for the holy vessels (PARATORIUM), the other for the sacred books, i.e. the oratory above mentioned.

DIÆTA (from the Gr. *diæta*, habit of living). A word which has been a puzzle to most scholars and antiquaries. RICH, *Illust. Companion*, s. v., says it is "the name given to some particular department of a house, the precise nature of which is not known. Thus much however is certain, it consisted of several rooms adjoining one another, and contained within the suite both eating and sleeping rooms." The word is used by SÆTONIUS in v. *Claud.*, 10, who simply says "he passed into the diæta called that of Hermes." The author who most frequently employs the term is PLINY, *Ep.*, ii, 17; v, 6; and vii, 5; who speaks of diæta in various positions. He particularizes 'two diæta in a tower; a cœnatio flanked (cingitur) by two diæta; a diæta in a garden; a diæta in which is a sleeping chamber (dormitorium cubiculum) excluding the daylight, sound, and clamour; and two diæta, in one of which are four cubacula; in the other, three, to be used for sun or shade as the sun passes.' In these passages it is true there is some uncertainty; but another in SIDONIUS APOLLINARIS, *Ep.*, ii, 2, clears up the matter. He says: "From this triclinium a passage is made into a diæta or small supper room" (cœnatiuncula). The diæta no doubt was a small living room, or rather what it was called a few years ago, an "eating room", distinct from and smaller than the triclinium or cœnatio, the dining rooms of state. It must be remembered that the Romans always slept in the middle of the day as well as at night, and this will explain the use of *cubacula* "aut sole utuntur aut umbra", as PLINY expresses it. Of this nature are the cubacula leading out of the atrium at Pompeii, which are painted black to moderate the heat of the sun. A. A.

DIETULA. A word used by PLINY, *Ep.*, v, 6, and which is evidently the diminutive of the preceding word. The phrase "mox dietula refugit quasi in cubiculum idem atque aliud," though very affected, seems to confirm the notion that "diæta" was a small eating room (cœnatiuncula), and that the diminutive of this, 'diætula', was so small that it was scarcely bigger than a cubiculum. A. A.

DIAGLYPHIC WORK. Sculpture in which the lines are sunk, in opposition to ANAGLYPHIC or embossed work. 2.



**DIAGONAL BOND.** A term applied to herring-boned work, also called work laid arriswise. **BRICK BOND.**

**DIAGONAL BRACE AND TIE,** see **BRACE**, and **DRAGOING** or **DRAGON TIE.**

**DIAGONAL VIEW.** A term in perspective, applied to express that the adjoining sides of an object make equal angles with the plane of the picture, which is then at right angles with the diagonal of the building. This is a most displeasing method of representing an object, but, as it saves trouble by dispensing with the profile of the nearest angle, it is often used in **ISOMETRICAL PERSPECTIVE.** A. A.

**DIAMETER.** The term used architecturally to express the measure across the lower part of the shaft of a column. This length has been used from the period of the Revival as a standard of scale, generally divided into two modules, each of thirty minutes, and by these the proportions of the parts of the order to which the column belongs may be indicated. It had been previously employed by **VITRUVIUS**, iii, 2, as dependent on the height of the column and the width of the intercolumniation; thus the diameter in the pycnostyle, systyle, eustyle, diastyle, and aræostyle arrangements, is, according to his dictation, to be respectively two-sixteenths, seventeenths, eighteenths, nineteenths, and twentieths, of the height of the column employed. The same author in the same chapter gives his mode of finding the proper diameter for the column of a portico by divisions of the intended frontage into twenty-three, thirty-six, and forty-nine parts, for tetrastyle, hexastyle, and octastyle porticoes respectively, except of the Doric order, which he considers separately, iv, 3. **INTERCOLUMNIATION; MODULE.**

**DIAMICTON.** A term used for a mode of building walls by **PLINY**, *H. N.*, xxxvi, 51, who says that "medios parietes farcire fractis cæmentis diamicton vocant." Immense quantities of this sort of work occur throughout Italy. The wall usually commences with a few courses of stone of different thicknesses laid in the manner called pseud-isodomon, or of brick. The outside face of the wall is then carried up with brick, stone, or marble, while the inside is lined with pieces of brick or stone from 4 to 6 ins. square, and about 3 ins. thick, set lozengewise, 'opus reticulatum', and which is intended to form a fair face to receive the plastering: the inside is filled in with any rubble material. **VITRUVIUS**, ii, 8, describes this work, without giving any name to it, as composed of three thicknesses, two being skins, 'coria', and one the middle stuffing, 'farcitura' or rubble hearting. As there was no bond in this sort of work the quoins are generally carried up in brickwork or masonry similar to that of the external facing, and courses of brickwork are laid at intervals through the whole thickness of the wall, like lacing-courses in English flint-work. Diamicton is often confused with *emplecton*, which is quite another thing. A. A.

"This stuffed masonry was used extensively by the Romans, especially in small work; and it was even employed by the Greeks on a larger scale, as the remains of their cities testify. It may be seen also in part of the Cyclopean walls of Arpinum, and even in the Etruscan ones of Volterra." **DENNIS**, *Cities*, etc., 8vo., London, 1848, i, 87 and 106.

**DIAMOND.** A parallelogram or quadrangular figure having equal sides and equal angles, which in decoration is always supposed to stand on one of its corners. A good illustration of its use as a running ornament is given, from Walmer, Kent, in the **GLOSSARY**, pl. 113. When cut with four facets to a central point like a pyramid, it was and is frequently called a **NAIL-HEAD.**

**DIAMOND FRET.** A species of checker work in which such a diamond as that described in the preceding article, is interlaced by the prolongations of the diameters of the square. A good illustration from the tower of S. Peter's church in Northampton is given in **BRITTON**, *Arch. Ant.*, 4to., London, 1826, v, and in the **GLOSSARY**, pl. 112; which last work, p. 118, applies the term to squares placed on their points at intervals, and joined by a piece of the same molding that forms them; as

in the article **CHEVRON**, from Lincoln cathedral, where it is properly termed an interrupted double chevron. It will be evident that any amount of repetition of closely fitted diamonds must be little more than an extension of the idea of a diamond fretted. The illustration is from a gable at the west end of Lincoln cathedral (indeed the Norman portion of that structure is full of diamond and of lozenge work, for diamonds are often a little elongated, especially, see fig. A in **CHEVRON**, when going round an arch), as given in **BRITTON**, *Arch. Ant.*, v; who also, iii, shows another variety from the north transept of the priory church at Christchurch, Hampshire. One from Dorchester, Oxfordshire, is given in the **GLOSSARY**, pl. 74. Opposed chevrons frequently take the appearance of diamond work.



**DIAMOND HAMMER.** A tool used by masons in the Isle of Man and in parts of Scotland for 'fine pick dressing' limestone and granite. It consists of a hammer head, in form



a parallelepipedon about 6 ins. long by 2½ ins. square, forged and filed at one end with sixteen pyramidal pick points; the other end has four cuneiform cutting edges, as though four chisels, or hews, or chares, were combined. A wooden handle about 14 ins. long is passed through the head. Though this tool saves labour, and produces a face superior to that given by the common pick, it is but little known.

The simpler end of this hammer appears to be exactly similar to that described by **VIOLLET LE DUC**, *Dict.*, s. v. 'Bretture', as the tool in use from the middle of the twelfth to that of the sixteenth century; the dents being made finer as the ages passed. R. R. R.

**DIAMOND WORK.** The name peculiarly appropriate to an arrangement of diamonds closely fitted and having the spaces either exactly similar, as in the curious example (recalling the Roman *opus reticulatum*) from the church of S. Augustine at Canterbury, as well as in the work of a doorway at South Weald church, Essex, both given in **BRITTON**, *Arch. Ant.*, v; or having alternately a plain and a worked diamond, as in the illustration from the ruins of Old Sarum, in a wall of the north gate to the close at Salisbury, given in the **GLOSSARY**, pl. 113.

**DIANA (TEMPLE TO).** There is perhaps no existing monument of any importance deserving this appellation, unless exception be made in favour of that structure supposed to be properly entitled the temple to Diana-Propylea at ELEUSIS. Parts of eight shafts 4 ft. 8 ins. in diameter, seem to be the remains of a decastyle temple, to the goddess, at Konkobar, now Concavar or Kengaver, about forty miles south-west of Ecbatana or Hamadan in Persia, which was celebrated by **ISIDORUS** of Charax; they are mentioned by **KEPPEL**, *Personal Narrative*, 8vo., London, 1827, ii, 88; and by **FRASER**, *Travels in Kourdistân*, 8vo., London, 1840, ii, 206. **EPHESUS.**

**DIAPER** (It. *diapro*; Fr. *diapré*). Any small pattern of flowers, foliage, geometric, or other forms, repeated continuously and uniformly over a surface, is now generally called 'diaper' and 'diaper work'. To a certain extent, however, this term is erroneous, as it ought strictly speaking to be restricted to such patterns only as are free from rectangular or diagonal lines intersecting each other, and forming a border or division to each separate repetition of the pattern. **CHECKER.**

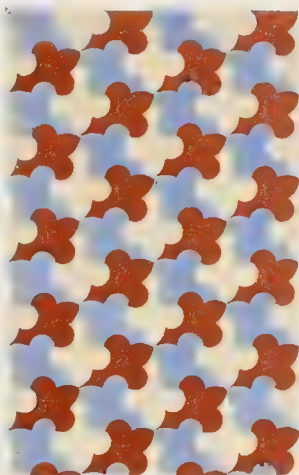
**SKINNER**, *Etym.*, fol., London, 1671, s. v., mentions unfavourably a suggestion that diaper meant *toile d'Ipre*, i. e. of Ypres;







## TAPES

Fig 1. From Vault of Lower Church, Assisi. (14<sup>th</sup> Cent.) 1/2 size.Fig 2. From a Picture in the Uffizi, Florence. (14<sup>th</sup> Cent.)

J. M. Lockyer M.I.B.A.

Figs 3 &amp; 4. From the Walls of Upper Church, Assisi.

(Amabue 13<sup>th</sup> Cent.)

Thos. Worthington.

C.F. Roll, Lith.





but, as noted in the *Encyc. Metrop.*, this has been adopted by ANDERSON and WARTON; it has been revived by PLANCHÉ, *History of British Costume*, 12mo., London, 1847, p. 126, who says, "though we read of diapers of Antioch, it is only because Ypres having given its name to its peculiar manufacture, any similar cloth received the same appellation"; leaving it to be inferred that as the distinguishing feature of 'diaper' is the peculiar mode of interweaving the pattern in the texture, so in process of time, any similar description of ornamental decoration received the same appellation; and the term 'diaper' was applied to the pattern as well as to the material. But inasmuch as the word in its earliest form is invariably "diaspre", and frequently occurs in manuscripts wherein it is evident no affinity or connexion with the *linge d'Ypres* could be intended, this derivation is open to considerable objection; and the following extracts from DUCANGE, s. v. *diapretus*, *diasperatus*, *diaperus*, *diapretus*, *diaprus*, tend to show that the term originally emanated from a very different source than from the then comparatively insignificant town in Flanders.

He cites a bull of Benedict VIII (1023), "et pluviale diasprum"; an inventory of the year 1100, "dalmaticam, etc. de diaspre rubro"; a charter of 1218, "tunica de diaspra alba"; and a will dated 1271, "casula de diaspro albo". Diapré, diaspré, is thus defined by ROQUEFORT, "Ornement d'étoffe précieuse qui est varié de plusieurs couleurs", corresponding precisely with *diapurple*, and the Italian *diapros*, "variety of colour."

The probability is that the term enjoyed a Greek origin (*διασπρην* meaning to disseminate, to scatter), and was originally applied much in the sense of the heraldic 'semée', to the richly embroidered tissues and stuffs of Byzantine manufacture which were renowned throughout Europe, and highly prized for ecclesiastical vestments. Examples of these will be seen in DE CAUMONT, *L'Abécédaire*, *L'Arch. Relig.*, who gives illustrations of copes preserved at Chinon and Metz, all of which are evidently of Eastern production.

A comparison of the plates of *Illustrations* under DIAPER, with the cuts given under CHECKER (erroneously called diaper) will render clear the distinction between them. The diaper unmistakably betrays its textile origin; and depending for its effect upon delicate precision of outline and contrast of colour, could not be translated into relief or intaglio without a certain loss of character and intention. Accordingly, such patterns are rarely found applied in the middle ages to stone or wood carving until a comparatively late period, and even then only in very low relief, often in direct imitation of embroidery, and in positions near the eye of the spectator, as for example in the numerous beautiful tombs of the Early Renaissance with which Italy abounds.

DIAPER WORK being, then, peculiarly adapted for mural painting, stained glass, pavements, and incised slabs and brasses, it is in them that examples must be sought. Works of the early painters of the Italian and Flemish schools, and manuscripts from the thirteenth to the sixteenth century, abound with innumerable patterns, in the canopies, hangings, pavements, and dresses portrayed in them. A fine selection from these sources has recently been published in *Les Arts Somptueux*, fol., Paris, 1858. The pattern No. 2 in the *Illustrations* above mentioned, coloured *sable* diapered *or*, is taken from a painting, now in the Belle Arti at Florence, by a Florentine master of the fourteenth century, which represents the Virgin and Child standing beneath a canopy, with drapery forming the background. The diapers, from the church of San Francesco at Assisi, illustrate their application to mural painting; the vaulting and upper portion of the walls are covered with frescoes by Cimabue and his school; beneath which are the imitations of tapestry hangings from which the examples in the plates are selected. These were probably executed towards the end of the thirteenth or the beginning of the fourteenth century. The fleur-de-llys pattern (No. 1 in the same plate) is taken from one of the ribs (a bold torus) of the lower church, and is rather earlier in date

ARCH. PUB. SOC.

than the preceding. Illustrations of the richly diapered stained glass windows at Cologne, Chartres, and Bourges, and also of diapered hangings and draperies, will be found in SHAW, *Decorative Arts of the Middle Ages*, 8vo., London, s. n.

A very beautiful incised slab, dated 1350, now preserved in the musée des Beaux Arts at Paris, represents a canon vested in alb, chasuble, maniple, and stole; the chasuble and the field are richly diapered; this is engraved in SHAW, *Dresses and Decorations*, etc., 8vo., London, 1843. Another, dated 1452, of the chevalier Martin, in the cathedral at Bruges, has the field diapered with his crest and motto. Another, rather later in date, in the same church, to the memory of Jean de Liekerke and his wife, is also covered with an elegant diaper. Both of these brasses, together with one in the church of S. Jacques in the same city, are given in GAILHABAUD, *L'Architecture du Vme au XVIIme Siècle*, 4to., Paris, 1858.

Two houses of the sixteenth century at Segovia, furnish examples of external diaper work impressed on the plastering with which the walls are covered, corresponding closely with SCRAFFITO met with in some parts of Italy; but such instances of impressed diapers are unusual, and probably result from the Saracenic influence which long prevailed in Spain. The religious and domestic edifices of the Mahometans abound indeed with marble or stone panels covered with intricate interwoven patterns carved in low relief, often perforated to admit light and air, as in the panels of the screen at the mosque of el Gaouly, at Cairo, given by GAILHABAUD, *L'Arch. du Vme*, etc.

During the sixteenth and seventeenth centuries leather was not unfrequently stamped with diaper patterns in gold, and under the name of *or basané*, used as wall hangings. The earlier examples have figures in slight relief painted in colours, or heightened with gold and varnished. Those which remain of the seventeenth century are simply powdered with flowers, etc., in gold. Manufactories for *or basané* existed at Paris, Lyons, and Avignon; those in Paris were established by Henri IV. In the present day, the richly stained diapered glass and the costly tapestries of former times are replaced by 'enamelled sheet', and by paper hangings, for both of which however a description of ornamentation is largely employed which must still be classed under the denomination of 'diaper'.

The arrangement and use of diaper work is discussed by BURGESS, in the *Builder Journal*, xvii, 4, who particularly remarks that when it was used to cover a large surface of wall, it was constantly varied in pattern.

J. M. L.

DIAPHANOUS. A substance is said to be *diaphanous*, or *translucent*, when it allows light to pass through its body without absorbing it entirely, or even in an important manner. Diaphanous or translucent bodies differ from *transparent* bodies in this respect, that the former do not necessarily allow the details of the objects seen through them to be perceived; they may allow the passage of light, but not of vision, so to speak. Transparent bodies are all diaphanous; all diaphanous bodies are not transparent. Rough plate and rolled glass, for instance, are diaphanous, but objects cannot be distinguished through them. DIATHERMAL.

G. R. B.

DIAPHRAGM VENTILATOR, or DOUBLE CURRENT VENTILATOR. In some mines a single large shaft is divided into two channels by a partition called a BRATTICE; one serving for fresh air to descend, the other for the outlet of foul air and of the smoke from a fire used to assist the upward current. In imitation of this arrangement, a single short tube of metal, divided by a diaphragm or brattice into two channels, has been fixed passing through the ceilings of rooms and stables. The diaphragm no doubt acts by dividing the upward and downward currents always existing in a single tube and each impeding the other. "This", according to ARNOTT, reported in *BUILDING CHRONICLE*, i, 67, "has many faults; it has no source of heat in one channel to make it draw strongly; the impure air approaching the opening to pass out is always rubbing against and mingling in a degree with the new air passing in: when



there is little wind and little difference of temperature in the two channels, there is little or no action; with closed doors and windows in the rooms below, and a strong fire, both channels become inlets of cold air: the cold air entering by it is not diffused in the room, and might be hurtful, like that from an open window. Yet with all these defects, it will in certain cases prove a useful aid, because it is a high opening to the external air and has tranquil action." These defects have perhaps been overcome by two patent contrivances; one invented by C. Watson of Halifax, 18 October 1843, and called the patent self-acting double current ventilator, which has been extensively adopted throughout Great Britain; the other about 1855, by J. McKinnell of Glasgow, which consists of one tube within another: *BUILDER Journal*, xiv, 576.

The philosophic principle made available in these ventilators, is that which obtains in an open ventiduct rising from a chamber whose temperature is higher than that of the external atmosphere, namely, that while a current of warm air ascends, a surrounding film of cold air at the same time descends, within the channel—the pressure of the latter, in fact, displacing the former. McKinnell's concentric tubes separate the currents; and according as the height of the efflux exceeds that of the influx, so is the effect enhanced. In buildings of only one story, the tubes may be entirely vertical; in those of more than one story, they have, in the lower stories, to be carried horizontally in the thickness of the floor above to a wall, wherein they are then carried vertically to the heights considered relatively desirable, where they may open horizontally to the external air. The bottom of the central or efflux tube has a trumpet mouth, or a surrounding flange, to act as a spreader to the inflowing current. The open tops of both tubes are covered at their respective heights. J. W.

The diaphragm flue has been recommended as a cure for smoky chimneys: *BUILDER Journal*, xv, 154; indeed, old kitchen chimneys have been found constructed with two flues, each having a separate top.

DIAS (PANTALÉON), perhaps a pupil of Contucci, was architect to John II of Portugal (1481-95), according to RACZINSKI, *Lettres*, 8vo., Paris, 1846, who shows, 219, 333, that he designed a chapel at Almeirim, and an oratory at Lisbon.

DIASTYLE. The word adopted from the Gr. *διάστημα*, to express an intercolumniation equal to three (Gwilt agrees with NEVE and STUART in saying "according to some, of four") diameters of the columns; which VITRUVIUS, iii, 2, says was attended with the difficulty of the architraves breaking on account of the length of the interval. DIAMETER. The word diastyle is also used to signify a building that has such intervals between the columns.

DIATHERMAL. Substances are said to be diathermal when they allow heat to pass through them. MELLONI has made interesting observations upon this property of bodies, and the following remarks are based upon the conclusions to which he has arrived. The quantity of heat which traverses bodies is generally greater in proportion to the degree of polish of the surfaces. It is (proportionally to the thickness) very different in different substances, and has no relation to their degree of translucence, or to their colour. Generally speaking, the heat transmitted diminishes in proportion to the thickness of the body it traverses; but in the case of rock salt, it appears that whatever may be the thickness, the quantity of heat which passes is the same. There seems also to exist some unexplained difference in the character and influence of the heat emanating from various sources; for nearly the whole of the solar heat passes through glass without raising its temperature, whilst only 70 per 100 of the heat emanating from flame, or 45 per cent. of that given out by incandescent bodies, or only 7 per cent. of that given out by bodies heated below a red heat, will pass through glass. Both fluids and gases are essentially diathermal; and they allow heat to be transmitted through them without sensible diminution. CONDUCTOR OF HEAT.

The peculiar laws affecting the diathermal power of glass have been applied in its use for screens, etc., and they should be taken into account in all calculations for heating rooms. According to the latest researches of PECKET, *Nouveaux Documents relatifs au Chauffage et à la Ventilation*, 4to., Paris, 1854, the loss of heat through glass would appear to depend mainly upon the thickness, but it is also affected by the height of the window experimented upon. He gives some elaborate formulæ for calculating the coefficient to be employed; but in practice the simple one which follows will suffice. Calling M the loss of heat per metre superficial per hour;  $t$ , the internal temperature in degrees of the centigrade;  $t'$  the external temperature; and K the coefficient of conductivity taken at 5: then

$$M = \frac{t - t'}{2} (K)$$

It is, however, to be observed that the loss of heat through the open spaces of sashes materially affects the correctness of these theoretical calculations, and for which great allowances must be made. Practically the most valuable lessons to be learnt from PECKET's observations are that the thicker the glass the greater resistance does it offer to the transmission of heat; and that it is only the bright rays of heat which easily traverse that material. DIAPHANOUS. G. R. B.

DIATHESIS, see DISPOSITIO.

DIATHYRUM. A term mentioned by VITRUVIUS, vi, 10, in the following passage, "item prothyræ græcæ dicuntur quæ sunt ante (in) januis vestibula, nos autem appellamus prothyræ quæ græcæ dicuntur diathyræ." BALDUS, BUDÆUS, and PHILANDER have given improbable interpretations, and SCHNEIDER has doubted the existence of the term. MAZois, *Ruines*, fol., Paris, 1812, ii, 18, has ingeniously translated the passage, applying the Greek diathyrum and the Romanized prothyrum to the passage between the door of the house itself and that of the atrium.

DIATONOS (Gr. *διὰ τόνος*). A brick or stone of large size used for the purpose of bond, and which evidently went through the whole thickness of the wall. VITRUVIUS, ii, 8 (ii, 4, has been constantly cited), in describing embleton work, says, "besides these they (the Greeks) place single (stones or bricks) between of equal thickness throughout (perpetuâ crassitudine) and faced on both sides (utraq. parte frontatos), which they call diatoni." As some copies have 'diatori', commentators have considered the former to mean long stretchers, stones of double the usual length along the front of the wall, and the latter (from *διὰ τόνος*) to mean the through-stones; while with many others, Gwilt, *Encyc.*, translates the word, 'angle-stone'. But diatonos must be regarded as the name for a bond stone of full thickness, which went through the wall, and was worked fair at both heads, just as is done in the best ashlar work of the present day. BOND; CHORIUM; COURSE; FRONTATUS; MASONRY; RAG WORK. A. A.

DIATOROS (Gr. *διὰ τόνος*). The reading in some manuscripts of VITRUVIUS, ii, 8, for *diatonos*. The word was preferred by PHILANDER, and is certainly in its derivation more like the English word 'through stone'; but as it occurs in no other author, in any sense connected with building, the latter word is preferred. DIATONOS. A. A.

DIAZ (DIEGO), maestro-mayor of the diocesan buildings, was appointed 5 August 1711, by his patron the archbishop of Seville, to supersede Leonardo de Figueroa in the completion of the collegiate church of S. Salvador in that city: the edifice was finished in February 1712. 66.

DIAZ (EL HERMANO FRANCESCO), a Jesuit settled in Granada, was commissioned in 1660 to examine with Gaspar de la Peña the works to the cathedral at Seville; it would seem he had already acted as architect to other considerable buildings, and that on his return to his college he continued to practise. 66.

DIAZ DE PALACIOS (PEDRO) succeeded Hernan Ruiz as maestro-mayor to the cathedral at Seville, but was dismissed

19 November 1574, on account of his not having presented at the time prescribed by the chapter some drawings which they required. The architect gained an action for reinstatement, and in 1588 the chapter, who had long replaced him by Juan de Maeda, whom they could not then dismiss, agreed to give Diaz the large pension of two hundred ducats, in consideration of an immediate resignation. This architect appears to have been in high repute, for he was appointed 1598 the successor of the younger Diego de Vergara, as maestro-mayor to the cathedral at Malaga, where Diaz was engaged 1623 in the construction of all that part of the edifice, which connects the *coro* with the principal entrance. A Pedro Diaz de Palacios, perhaps the son of the above named architect, was engaged 1627 with Bartolomé de Herrada on the fine lateral doorway of the parish church at Gumiel de Izan in Castille. 66.

DIÁZ GAMONES (DON JOSEF), acting as *aparejador* or assistant architect, finished, from the designs of Virgilio Ravaglio, the palace of Riofrio near Segovia, where he designed several important works. Being appointed architect to the palace of S. Ildefonso or la Granja in Old Castille, he there erected about 1766 the barrack of the body-guards, the casa de los Infantes, and the glass factory. 66.

DIÁZOMA. The Greek term (διάζωμα) used by VITRUVIUS, v. 6, answering to ΠΡΑΞΙΝΚΤΙΟ, a wide passage running parallel with the seats of a theatre or amphitheatre, along which the people passed till they came to the stairs leading to the *cuneus* or division in which were their places. A. A.

DICASTERIUM. The name (δικαστήριον) given at Athens to the place where certain causes dependent upon positive enactments were decided by the *δικασταί*. Five existed there in early times; the principal one being at the Areiopagus was held in the open air. Nothing particular is known as to their form. The judges sat on benches covered with cushions, *ψαθλα*; and there were tribunes, *βήματα*, from whence the advocates spoke: there was also a bar or railing to keep off the pressure of the people. The name became afterwards applied to nearly all courts, and like ourselves, not only to the court house, but to the judges themselves. There was a structure called Dicasterium at Alexandria, in which, under the Ptolemies, the senate assembled and discharged such magisterial duties as a nearly despotic government allowed to them, and where afterwards the Roman Juridicus held his court. A. A.

DICKENSON (WILLIAM), living in the middle of the seventeenth century, and being at that time surveyor of the church, is said to have designed the rose window to the north porch of Westminster abbey (the glass is dated 1722); and to have been the superintending surveyor, under Sir C. Wren, in the erection 1671-80 of S. Bride's church, Fleet-street, London.

DICTIONARY OF ARCHITECTURE. The remarkable paucity of works, which can be admitted to lay just claim to this title, may be seen from the following list.

GRAPALDUS, *De Partibus Aedium*, 4to., Parma, 1494 (?); but 1516 is the best ed.; BALDUS, *De Verborum Vitru. Signif.*, 4to., Aug. Vind., 1612; D'AVILER, *Dict. d'Arch. Civile et Hydraulique*, etc., 4to., 1691, 1st edit.; NEVE, *City and Country Purchaser's and Builder's Dict.*, 8vo., 1703; 1736, 3rd edit.; THE BUILDER'S DICTIONARY, 8vo., 1734; AQUINUS, *Vocab. Arch. Aedif.*, 4to., Rome, 1734; PENTHER, *Lex. Arch. Germ.*, fol., Augsburg, 1744-8-75; GASTELIER, *Dict. Etymol. des Termes d'Arch.*, etc., 12mo., 1753; VIRLOYS, *Dict. d'Arch. Civile*, 4to., 1770; THE BUILDER'S MAGAZINE, 4to., 1779, 2nd edit.; QUATREMÈRE DE QUINCY, *Dict. Hist. d'Arch.*, 4to., 1788-1820; reprint, 1832; ORSINI, *Dis. Univ. d'Arch.*, 8vo., Perugia, 1801; GROHMANN, *Handwörterbuch über die bürgerliche Baukunst*, 8vo., Leipzig, 1804; NICHOLSON, *Arch. and Eng. Dict.*, 4to., 1819; new edit. by LOMAX, 4to., 1853; VAGNAT, *Dict. Port. des Termes usités en Arch.*, 8vo., Grenoble, 1819 and 1827; STUART, *Dict. of Arch.*, 8vo., 1830 cir.; A GLOSSARY OF TERMS USED IN ARCH., 8vo., Oxford, 1851, 5th edit.; BRITTON, *Dict. of the Arch., etc., of the Middle Ages*, 8vo., 1838; SORRESINA and

BINDA, *Vocab. Univ., etc., degli Arch.*, etc., 4to., Milan, 1839; GWILT, *Encyc. of Arch.*, 8vo., 1842, and Append., 1851; 1854, 3rd edit.; CRESY, *Encyc. of Civil Engineering*, 8vo., 1847, and Suppl., 1856; 2nd edit., 1856; WEALE, *Rudimentary Dict. of Terms used in Arch.*, etc., 8vo., 1850; BERTY, *Dict. de l'Arch. du Moyen Age*, 8vo., 1845; HEBERT, *Engineer's and Mech. Encyc.*, 8vo., 1836: 1852, 2nd edit.; BRES, *Illustrated Glossary of Practical Arch. and Civil Eng.*, 8vo., 1853, 2nd edit.; VIOUET LE DUC, *Dict. Raisonné de l'Arch. Franç. du Onzième au Seizième Siècle*, 8vo., 1853, in progress; BELL, *Allerthum Wortregister der Baukunst*, Eng. and Germ., 8vo., Leipzig, 1855.

DICTORIUM. A term which has been used for AMBO.

DICTYOCHETON. This word, called DICTYOTHETON by GWILT, *Encycl.*, and by some other writers, is explained by them as masonry worked in courses like the meshes of a net, i.e. opus reticulatum: also open lattice work for admitting light and air. It seems however to be a corrupt reading for DIAMICTON in PLINY, *H. N.*, xxxv, 51. 2. 6.

DIDORON. A term used by VITRUVIUS, ii, 3, and by PLINY, *N. H.*, xxxv, 49; for a brick a foot long, and half a foot wide. PHILANDER reads the words Dyodoron; and HERMOLAUS, Lydoron. The Greeks however rarely used the word δῶν in composition, but generally δι; as to the second reading, it would have been Lydion, as PLINY writes it, not Lydoron. An explanation of the dimensions are given in BRICK, p. 137, as well as their equivalents in English measure. A. A.

DIDYMA (Gr. Διδύμα) or DIDYMI (Gr. Διδύμοι). The name of a site, about ten miles south of Miletus, in Asia Minor, sacred to Jupiter and Apollo; the place was originally, according to PLINY, v. 31, called BRANCHIDÆ (Gr. Βράγχιδαι) the name of the body of priests, who there served in the temple of Apollo Didymæus or Didymeus. This temple, burnt B.C. 494 (HERODOTUS vi, 19), or perhaps as late as 479, by the Persians, was rebuilt for the Milesians by PÆONIUS of Ephesus, and Daphnis of Miletus, according to VITRUVIUS, vii, pref., who not only shews that this Pæonius, with Demetrius, finished the temple commenced by Chersiphron and Metagenes to Diana at Ephesus, and thus fixes his date before the birth of Alexander, B.C. 356, but states that these buildings, with the temple to Jupiter at Athens, and that to Ceres at Eleusis, were the four marble temples so celebrated in ancient times as to render the names of their architects immortal. STRABO, xiv, however, intimates that the temple of Apollo Didymæus, the largest of all temples, remained in his time without a roof; and SÆTONTIUS, in *Vit.*, notices that Caligula proposed to complete it. The heap of ruins (described by DALLAWAY, *Constantinople*, 4to., London, 1797, p. 247-8, and illustrated by the SOCIETY OF DILETTANTI, *Ionian Antiquities*, fol., London, 1769, i. 47), discloses the fact that the temple was decastyle and dipteral, with columns 63 ft. high, 6 ft. 6 ins. in diameter, with an intercolumniation of 1½ the diameter, and that the western front was 162 ft. 10 ft. long. It is to be regretted that the Society has not published the materials specified in its *Report*, 1814, as having been collected by their second expedition. LEAKE, *Journal, etc., in Asia Minor*, 8vo., London, 1824, p. 348, notices that the temple had twenty-one columns on the flanks, and four between the ante of the pronaos; in all a hundred and twelve. The fluting of the columns is finished only in the exterior order; in the interior it exists only under the capital. The material of the temple is white marble—in some parts bluish. He adds, p. 239, that the sacred way or road leading from the sea to the temple, "bordered on either side with statues, on chairs of a single block of stone, with the feet close together, and the hands on the knees,—is an exact imitation of the avenues of the temples in Egypt". The illustrations above named give no account of the interior, described by DALLAWAY as having "an open corridor formed by two orders, one above another"; but the explanatory text adverts to the discovery of a base, in its



place, at the north-west angle of the outer range. It describes the various and peculiar capitals of the pilasters; the filling-in pieces of ornament consisting of griffins and lyres; the Ionic order, according to the then standing single column of the inner range, fluted for two feet below the capital and about one foot above the base, and to the two pillars of the outer range (which alone are mentioned by LEAKE); and the capital, of a quasi-Corinthian order, found within the wall, which separated the naos from the pronaos. It also remarks that the cella had, like the temple on the Ilissus at Athens, no posticum; and, almost consequently, "no door in the west or back front, of which omission (except in temples *in antis* and in the *prostylos*) only three other instances have occurred", viz. in the cases of the Athenian temple just named, of the temple to Jupiter Nemeus in Achaia, and of the temple at Jackly.

**DIALON.** This word is used by VITRUVIUS, v, 11, in the following passage: "in the *Palæstræ* let square or oblong peristyles be made, so that they may contain two stadia in circuit, which the Greeks call *διαιλον*." Three courses seem to have been in the stadium; the ordinary course, the *διαιλος*, and the *δολιχος*: the first the length of the stadium; the second the length and back; and the last, according to some, four, and to others, six lengths.

A. A.

**DIE** (It. *dada*, Sp. *dado*, Fr. *dé*, Ger. *würfel*). The name technically applied to the body (generally approaching in appearance to a cube) of a pedestal, often provided with a capping and a base, to a pillar, statue, balustrade, etc. **DADO.**

A balk of timber square throughout its length is said to be 'die square.' The name die is also given to a **BILLET**.

**DIE.** This word is employed as a verb to express the gradual cessation of certain works, e.g., moldings which run into a sloping face are said to die into it.

**DIE** or **DIEZ** (the Roman *Augusta Dia*, and *Dia Vocontiorum*). A city, which preserves its walls and their towers, in the department of the Drome in France. As the churches and monasteries were ruined in the sixteenth century, the chief buildings now are the ancient triumphal arch, which serves as the porte S. Marcel; the church, dedicated to the Virgin, which was cathedral until 1275, and from 1692 until 1801; the Protestant church; the former episcopal palace; a *seminaire*; and two hospitals or almshouses.

50. 74.

**DIE, DIEY** or **DIEZ** (**SAINT**) in Latin *Fanum Deodati*. A well built city in the department of the Vosges in France. Walls dating from the thirteenth century, enclose well-built houses forming straight streets placed at right angles to each other. The only building of importance, however, is the church dedicated to the saint from whom the town is named, and made cathedral 1777: great part of the nave belongs to the eleventh century, while the *sanctuaire* is in the style *ogival primitif*, and the *portail principal* or west front a modern work, according to BOURASSE, *Cathédrales*, 8vo., Tours, 1843.

50. 74.

**DIEDO** (ANTONIO) assisted in editing CALDERARI, *Disegni e Scritti*, fol., Vicenza, 1808; published an *Elogio del professore Gio. Ant. Selva*, 8vo., Venezia, 1819; and assisted CIOGNARA in *Le Fabbriche, etc., di Venezia*, fol., Venezia, 1815-20; his own works are shewn in *Fabbriche e Disegni*, fol., Venezia, 1846.

**DIENG** in Java, see GUNUNG-DIENG or PRAHU.

**DIERES.** The Greek term *διήρης*, or double (*μελάρων* being supplied in EURIPIDES, *Phœn.*, 90), which like *ὑπερφῶν* indicated the upper story that usually, though not always, existed in Greek houses, and that appears to have extended but seldom over the whole of the lower floor. **HYPEROUM.**

78.

**DIEREX** (HERMAN PELGROMS) was one of the architects at Bois-le-duc appointed 1526, and was contemporary with A. HANENBERG.

21.

**DIETRICH** (WENDEL), said to have been a cabinet maker (*tischler*) at Augsburg, who built 1587 a land-haus at Innigen near that city, entered 1598 the service of the Bavarian court with a salary of 300 florins, and is supposed to be the

same as DIETTERLEIN. LIPOWSKY, *Baierischer Kunst.-Lex.*, 8vo., Munich, 1810.

68.

**DIETRICH**, see DITERICH (FRIEDRICH WILHELM).

**DIETTERLEIN** (WENDEL). A painter, who was invited from Strasburg by Ludvig (duke of Wurtemberg 1591-3) to build a lust-haus, completed 1591, at Stuttgart. He there published, 1593-4, an important, and now excessively rare, work in the history of the Art, entitled *Architectura, etc.*, of which there was a second edition, 209 pl., fol., Nuremberg, 1598; the latter having a portrait of him. He died 1599, aged 49.

68.

**DIEUSSART** (CARL PHILIPP) was about 1683 churfürstlicher architect (and also sculptor) with a salary of 200 thalers, at Mecklenburg, and styled himself 'Romanus' (probably from having studied at Rome) in his *Theatrum Architecturæ Civilis*, fol., Güstrow, 1679, of which so few copies were printed that another edition by L. Dinzenhofer appeared at Bamberg 1697. **NICOLAI**, *Nachrichten, in Beschreibung von Berlin*, 8vo., Berlin, 1786, p. 45.

68.

**DIGGEM** or **DIGUEM**. A village, the ancient name of which is unknown, in Nubia. The plan of a temple about 100 ft. in depth is given by GAU, *Antiquités*, fol., Paris, 1822, pl. 63, who notices that it had been entirely covered by the sand, that he saw remains of another, and that he infers the existence of more under the sand.

**DIGGER**; **DIGGING**; see EXCAVATOR and EXCAVATING.

**DIGHOUR.** A town near Kars and Ani in Armenia. It is remarkable for its church, finished in 1242, which has neither porch nor narthex; while two large niches, with seats on the right and left of the apse are presumed to indicate the former existence of an external gallery or place kept apart. The dome, carried on four square piers, assumes internally, to some extent, the shape of a truncated cone finished hemispherically. The most remarkable feature of the church is the horse-shoe arch to each of the doors, from which TEXIER, *Desc. de l'Arménie*, fol., Paris, 1842, i. 119, 150, pl. 25-8, who gives a plan, a view, and two elevations, concludes that this form, almost peculiar in later times to Mahometan works, was introduced into Western Asia by Christian builders.

**DIGIT**, the Roman digitus. A measure of length, containing the sixteenth part of a Roman foot, i. e. about 0.7281 of an English inch.

78.

**DIGLYPH.** The name given to two perpendicular channels placed beside each other; as in a curious example of two flutes sunk between a bucranium and a patera (probably ornaments to a frieze for a Doric order) engraved in MURPHY, *Travels in Portugal*, 4to., London, 1795, pl. 14, p. 298. Another example is found on the face of the console commonly called Vignola's, which was imitated by Boffrand in the entablature to the Hôpital des Enfants-trouvés at Paris.

5.

**DIGNE.** A city in the department of the Basses Alpes in France. It preserves its three gates in the old walls, flanked with towers, and consists of steep, narrow, winding streets, of houses badly built, with the exception of the hôtel de la préfecture, the episcopal palace, and some pretty fronts. The chapter sits in the church of S. Jerome, sometimes called *cathédrale fort magnifiante*, in the cité above described, as the *bourg* (so ruined, 1562 and 1591, by the Protestants, that it is now desolate, and has only two or three streets) possesses the cathedral (twelfth century), dedicated to the Virgin. The *bourg* was remarkable as a duplicate of the *cité*, even having a bridge of its own, and being the same in circumference.

50. 74.

**DIJON.** The capital, formerly of the extinct duchy of Burgundy, and now of the department of the Côte d'Or in France. The streets are straight, wide, lined with good houses chiefly built of freestone (although of timber in 1300), and exhibit much work in the Burgundian style of Flamboyant Gothic of the fifteenth century. The site of the fortifications is now occupied as boulevards; the park, ten furlongs distant, was planted by Le Notre. The church, once cathedral and dedicated to S. Etienne, became the halle au blé: the church of S. Jean, dating

1466, with a roof of 43 ft. span without a tie-beam, is used as the *marché-du-midi*, the choir having been destroyed 1810; and the church of S. Philibert has been converted into cavalry stables. LABORDE, *Monuments*, fol., Paris, 1816, and MAILLARD DE CHAMBURE, *Voy. Pitt. en Bourgogne*, fol., Dijon, 1833, illustrate the following buildings. The conventual church, about 213 ft. long, 87 ft. wide, and 84 ft. high, dedicated to S. Benin (properly Benigne) 1280-91, is the present cathedral; its remarkably slim timber spire (1742) rests on an open base above the roof, and rises to the height of 375 (? 300) ft. from the ground: the baptistery or round church, destroyed 1793, is given in HUGO, *France Monumentale*, 4to., Paris, 1836, ii, pl. 57; and with a plan, by LENOIR, *Monuments*, fol., Paris, 1840, pp. 12, 13, pl. 8. Behind the choir is the large episcopal palace, 1775, formerly the abbot's house. The new church of S. Michel, 188 ft. long and 60 ft. wide, consecrated 1525, is said to have been up to that time partly, if not wholly, the work of Hugues Sambin, "architecteur"; the works of the central tower were stopped at the siege, 1513; the right-hand tower, having an octagonal cupola, was executed 1659, and that on the left hand 1670: CHAPUY, pl. 65. The church of Notre Dame, commenced before 1229, consecrated 8 May 1334, although still unfinished, was the admiration of Vauban and of Soufflot; its porch is claimed by various authorities for the middle of the thirteenth or of the fourteenth century; the central tower has been left incomplete at the height of 114 ft.; the turret, supposed to have been constructed 1382 to receive the second clock erected in France, has no importance. The plan given in LABORDE, pl. 170, shows a Latin cross with an apse to the east end and to the east side of each transept, as common in the churches of the district. The nave is only 24 ft. wide, the columns 13 ins. in diameter, and the aisles are only 10 ft. clear between the plinths. The external dimensions are 74 ft. 6 ins. wide and 213 ft. 3 ins. long, the porch being 42 ft. deep. The internal dimensions are 153 ft. 6 ins. long (without the porch), 56 ft. 6 ins. wide, and 60 ft. high. This building is also given in the *MOYEN AGE MON.*, pl. 182, 196, 201, 245; and by LENOIR, *Atlas*, pl. 32.

The second palais des ducs, commenced on a new site 1172, may be seen in the front of the present palais on the side called la petite promenade. The edifice, nearly rebuilt 1366, and exhibiting chiefly the tour de Brancion, 1364-1404, called tour de Bar after 1431 (the kitchens are worth notice), and the tall tower called the terrasse 1419-67, converted 1778 into an observatory, has been much altered: the southern front dates, like the arcaded crescent called the place-royale or place d'armes which it faces, about 1686, and is properly the palais des états; its right wing was designed 1775 by Gauthey, but the staircase which leads to the large hall of assembly was executed 1733 by Gabriel; the left wing, with the grille to the place, dates 1784, and is the musée, which occupies the former salle des gardes des ducs and some other rooms. Noting the tombs of the dukes Philip (ob. 1405) and John (ob. 1419), mention should be made of the celebrated chimneypiece (CHAPUY, pl. 66), which MAILLARD says is about 30 ft. high and 20 ft. wide, generally dated 1504, but perhaps only then restored after the fire which, 1502, destroyed the almost unique panelled and (pointed) vaulted ceiling, now replaced by a painted one. The musée also contains a model of the Ste. Chapelle, formerly belonging to the palace. This building also contains the municipal offices, is in fact the hôtel-de-ville, and besides affords the apartment used for Divine Service by the Protestants. The palais de justice, ordered to be built 1510 by Louis XII, with the command that it should contain one of the finest *auditoires* in France (the present court d'assises), has a good coffered ceiling; the front was altered to Renaissance work, and the salle des pas perdus, with its pointed vault of woodwork, was built about 1549, but the works were not completed until 1586-90. In the rue du Trésor by its side, is the former hôtel of the jurisdiction of the treasurers of France, now the tribunal de première instance.

ARCH. PUB. SOC.

The remains of the square *château-fort* date about 1478-1512. The theatre, 1810-12, by Célérier, was discontinued until 1822, when Vallot made various alterations, and it was opened 1828; an octastyle portico of unfluted Corinthian columns has a plain attic over it; the structure, although locally considered too delicate in its embellishment, was ranked only second to that at Bordeaux. The following have also been noted as interesting: the hôtel des ambassadeurs (or) d'Angleterre, so called since 1419-35, but proved by CLUTTON, who illustrates it in *Remarks, etc., on the Domestic Architecture of France*, fol., London, 1853, to be the hôtel Chambellan, in the rue des Forges, behind the palais des états; the gateway, 1604, of the hôtel Vogué in the rue de la Chouette or de Notre Dame; all given by MAILLARD, as well as the court, now destroyed, of the hôtel Bernardon, by the side of the hôtel des archives (the old hôtel-de-ville). To these may be added the tomb of Philippe Pot, with the six 'weepers', 1494, from the Chartreuse, in the garden of the hôtel Vesvrotte, LABORDE, pl. 215; and the stone bench in a street near the church of S. Michael, with the newel of a staircase near that of Notre Dame, which alone are noted in the Guide-books. The four hospitals, especially the orphan-Ste. Anne with its dome, six educational establishments, and two nunneries, are perhaps the only other public buildings of note. About a mile from the town are an entrance gateway; a tower 60 ft. high, once belonging to the north aisle of a church; and the pedestal of a cross once occupying the centre of a wall at the ayle des aliénés, formerly the Chartreuse, founded 1383, from which the above named tombs were removed; illustrations are given by LABORDE, pl. 188, as well as by MAILLARD. NOELLAT, *Guide du Voyageur à Dijon*, 18mo.; GIRAULT, *Précis Hist.*, 12mo.; DARCY, *Les Fontaines Publiques*, etc., 4to. JOLIMONT, *Descr.*, 4to., 1830. 28. 50. 96.

Dijon deserves the serious attention of the architectural traveller, who will find most remarkable churches of all periods of mediæval art, from the Byzantine down to the richest Flamboyant. There are also some very fine old timbered houses and other works of art of high value, as may be inferred from the fact that the dukes of Burgundy vied with royalty to render Dijon on a par with Paris itself as a centre of art. T. L. D.

DIKE. This word has two significations in Great Britain: in the south it means a valley, cutting, or ditch, as the Devil's Dyke near Brighton, while in the north it is applied to a fence wall of stone laid without mortar, or of clay, as Graham's Dike, properly Hadrian's wall, which extends from Dumbarton to Linlithgow: under the latter explanation it answers to the Sp. *albarrada*, derived from the Arabic, and implying the use either of stone or clay, but chiefly of the latter material. Dike is also used to express an artificial bank for retaining water, either in the case of a river, or of the sea.

DILAPIDATION (Fr. *dégradation*). Dilapidation is the defect resulting during an occupancy from neglect or misuse, and is of two descriptions, civil and ecclesiastical. The former is entirely under the control of the common law, according to the nature of the tenure by which the property is held, and to the covenants of the lease. The latter is subject both to the ecclesiastical and to the common law. Civil dilapidations have been defined in the *Report on Dilapidations* by the Select Committee of the Royal Institute of British Architects, 8vo., London, 1844, to be "those defects only which have arisen from neglect or misuse; and not to extend to such as only indicate age, so long as the efficiency of the part still remains. But if the effects of use or age have proceeded so far as to destroy the part, or its efficiency in the structure, this argues neglect or misuse; it being the presumption that at the commencement of his term the tenant was satisfied that every part was sufficiently strong to last to its close." In civil dilapidations, a tenant is bound according to his covenant, specific or general, but never beyond maintaining and upholding, unless the conditions of repair are so bad that no measures short of reconstruction are consistent with safety, or possible from the extent of decay. It



must be observed that the degree of liability in a tenant is regulated by the actual condition of his premises at any time, as specified in his covenant, and admits of no extenuation by reason of dilapidations existing at the commencement of his tenancy, as he is presumed to have taken the proper course to guard himself against the occurrence of undue liability, and the law will not relieve him from the consequence of his own laches. In extreme cases, the liability of a tenant extends to the rebuilding of a party wall condemned as unsafe, to reconstruction after fire, etc., unless specially excepted.

In ecclesiastical dilapidations, the principle of liability should be assumed as that of a tenant under a general covenant, to repair, uphold, and maintain, and as extending to all works requisite to maintain and keep the structure in its entirety, in good tenantable and habitable condition, free from decay, and perfect in all its parts, but not extending to purely decorative works, or such as have reference to any special or individual occupation. This latter case would apply to those instances of frequent occurrence where buildings have been erected by a wealthy incumbent too large for the income of the benefice, when his successor is assuredly not bound to keep them up. With regard to ecclesiastical dilapidations, the committee were of opinion that the "usual practice is to consider that (independently of the obligation to compensate for actual deficiencies) the representatives of a late incumbent are liable for the value of repairs equivalent to, or consonant with, the extent of those which in civil cases a lessee would be called upon to perform on taking a lease for twenty-one years, under an agreement to put the premises into complete and substantial repair at the commencement of such a term. The committee, however, especially direct attention to the case of Wyse *versus* Metcalfe, and the judgment of the Court delivered by Mr. Justice Bayley in that case, directing the Master to calculate the damages upon the principle that the incumbent was not bound to supply or maintain anything in the nature of ornament, such as painting (unless necessary to preserve exposed timbers from decay), whitewashing, and papering." ELMES also, describes the latter to be "the pulling down or destroying in any manner any of the houses or buildings, or any part of the inheritance belonging to a spiritual living; or the suffering them to run into ruin or decay; or the wasting, destroying, or using contrary to law, any of the woods or other property belonging to the church." And GIBBONS notes that "ecclesiastics are entitled to possess houses for residence, and other tenements, during their incumbencies of their benefices, as a reward for their services in the celebration of divine worship and the diffusion of religious knowledge. The tenements pass from incumbent to incumbent in perpetual succession; no other fund is provided for repair or restoration of dilapidation and decay, save the revenues of the benefice. They are necessarily bound to repair every description of dilapidation in the most substantial manner."

Although there is a general impression that damage of broken glass only can be claimed from a tenant from year to year, not being liable to general repairs which include the support and maintenance of the building, and although he of course is not liable for permissive waste, nor to make good mere wear and tear, he is to use the premises in a husbandlike manner; he is bound to fair and tenantable repairs so far as to keep it wind and water tight and to prevent waste or decay of the premises, but he does not incur substantial and lasting repairs, such as new roofing and such like.

ELMES, *Architectural Jurisprudence*, 8vo., London, 1827; GIBBONS, *The Law of Dilapidations and Nuisances*, 2nd edit., 8vo., London, 1849; GRADY, *Law of Fixtures and Dilapidations, Ecclesiastical and Lay*, 12mo., London, 1849, reviewed in the *Architect Journal*, 1849, 473. FIXTURE; VALUATION; WASTE. With regard to CHAMBERS and TATTERSALL, *Laws relating to Building*, 12mo., London, 1845, it has been said that "the section on dilapidations is discriminating and clear. It is

to be regretted that it contains a sweeping condemnation of the report on dilapidations published by the Institute of British Architects—a condemnation in no way authorized by the evidence adduced"; *BUILDER Journal*, 1846, iv, 22.

DILATATION. The increase which takes place in a body in consequence of a heightened temperature.

LAVOISIER and LAPLACE ascertained that between 32° and 212°, the lineal dilatation of solids was uniform, and that consequently the dilatation was equal for every additional degree of temperature, excepting in the case of steel, whose dilatation per degree diminished as the temperature rose. This exception appears to be owing to the changes superinduced by heat, for it was found that 'shear' steel expanded less even than 'blistered' steel. The coefficient of dilatation is the increase of the unity of length of a body for every degree of increase of temperature; and the following table (calculated upon the centigrade scale) is extracted from DAUVIN, *Traité Élémentaire de Physique*, 8vo., Paris, 1858.

Table of Lineal Dilatation for every Degree of Centigrade from 0° to 100°.

Substance.	Coefficients.	Substances.	Coefficients.
English flint glass .....	0.000,008,116	Rhinegold .....	0.000,010,114
French glass (with lead) ..	" 8.71	Iron, hot or fused ..	" 24.31
Tube of do. (without lead) ..	" 8.60	Copper .....	" 17.74
S. Gobain glass .....	" 8.88	Brass .....	" 17.22
Platinum .....	" 0.018	Silver (Paris st.) ..	" 14.86
Steel, not tempered .....	" 10.792	" (cupelled) ..	" 19.997
Cast iron .....	" 11.100	Malacca tin .....	" 19.376
Steel, shear .....	" 12.395	Bismuth .....	" 15.916
Soft wrought iron, hammered	" 12.404	Falmoth tin .....	" 14.399
" " drawn .....	" 12.350	Lead .....	" 28.185
Standard gold, ingot .....	" 14.400	Zinc .....	" 29.416

According to some authors, wood when properly seasoned does not expand so much in the direction of the fibres as glass would do; but according to ROY, fir dilates, lineally, as much as glass. The coefficient of brown pottery (per degree centigrade) is 0.000,004,166; and according to WEDGEWOOD, the dilatation may be materially diminished by rendering the earth porous, as by mixing charcoal with it. From the table given above, it would appear that zinc, and then lead, are the metals which dilate the most; platinum dilates the least, and glass is affected by heat in nearly the same manner as platinum: hardness and ductility have apparently little to do with the rate of expansion, but the metals which are the most dilatable are at the same time the most easily fusible.

Some writers state that the coefficient for the cubical dilatation of a substance may be considered to be, with a sufficient accuracy for practical purposes, equal to three times the coefficient of the lineal dilatation; just as the coefficient of the superficial dilatation may be taken to be twice that of the lineal one. But the error necessarily introduced by this mode of approximation, becomes of serious importance when the temperature is raised above the boiling point (100° of the centigrade scale). Thus DULONG and PETIT found that the dilatation as ascertained by the thermometer was greater than the one indicated by theory; thus—

Table of the Cubical Dilatation of Substances from 100° to 300° Centigrade.

Real temp.	Glass	Iron.	Theor. temp.	Copper	Theor. temp.	Platinum	Theor. temp.
100°	"	100°	100°	"	100°	"	100°
200	"	213.2	"	"	"	"	"
300	"	352.9	"	"	328.5	"	311.6

so that the rate of dilatability of solids increases above 100°, but in an unequal degree in each of them. It also appears that the solids which dilate the most under the influence of heat are also those which have the lowest coefficient of elasticity, or in fact are compressed with the most difficulty.

The dilatation of liquids increases regularly in proportion with the increase of temperature; and it appears that, generally speaking, those liquids dilate the most easily which have the lowest point of ebullition, and are also those which are the most easily compressed. DALTON gives the following table of

the dilatation of certain liquids between 32° and 212° Fahrenheit (0 to 100 centigrade).

Nitric acid, diluted in volume	-	-	1-9 = 0-11
Alcohol	-	-	1-9 = 0-11
Fixed oils	-	-	1-12 = 0-08
Sulphuric ether	-	-	1-14 = 0-07
Essence of turpentine	-	-	1-14 = 0-07
Hydrochloric acid	-	-	1-17 = 0-06
Sulphuric acid	-	-	1-17 = 0-06
Water saturated with salt	-	-	1-20 = 0-05
Pure water	-	-	1-22 = 0-0466
Mercury	-	-	1-80 = 0-02

The greatest density of pure water is observed to exist when its temperature is 4° centigrade (39-2° Fahr.); above and below that degree it increases in volume, or dilates uniformly.

The dilatation of gases is uniform between 0 and 100° centigrade; and their coefficient of dilatation is stated to be, for all gases, whether pure or mixed, about  $\frac{1}{273}$  or 0-00375. Above 100° centigrade the dilatation of gases diminishes in proportion to the increase of the temperature, as was previously observed to be the case also with solids. The pressure to which gases are exposed appears to affect their dilatation.

ADIE, in the *Transactions* of the British Association, 1834, gives an interesting paper on the dilatation of building materials. From this it would appear that up to 180° Fahrenheit, or with a range of temperature equal to 145°—

The Craigleith stone dilated	0-0011758	of its length.
Black Galway marble	- 0-00043855	"
A rod of oak	- 0-000062007	"

A paper by ROBERTS, in the *Transactions* for 1850, would appear to cast some doubt upon the previous observations of GUY LUSSAC, LAVOISIER, TROUGHTON, SMEATON, and others. But as the differences in the coefficients of lineal dilatation only affect the seventh place of decimals, it may be sufficient here to observe that his results are slightly in excess of those indicated by his predecessors.

G. R. B.

The results of a series of experiments upon the EXPANSION of various stones and other materials, produced by the heat of steam and measured with a pyrometer, are reported in the *Transactions* of the Royal Society of Edinburgh; namely,

	Parts of Length.
Roman cement	- - - 0-014349
Sandstone, liver rock of Craigleith quarry	- - - 0-01743
Cast iron, rod cut from a bar 2 ins. square	- - - 0-0114676
Sicilian white marble	- - - 0-0110411
Slate, Penrhyn quarry, Wales	- - - 0-010376
Arbroath pavement	- - - 0-0008985
Peterhead red granite	- - - 0-0008968
Caithness pavement	- - - 0-0008947
Greenstone from Rutho	- - - 0-0008689
Aberdeen grey granite	- - - 0-00078943
Carrara marble	- - - 0-0006539
Best stock brick	- - - 0-0003502
Fire brick	- - - 0-0004228
Stalk of a Dutch tobacco-pipe	- - - 0-00034573
Round rod of Wedgwood ware 11 ins. long	- - - 0-00046294
Black marble from Galway	- - - 0-00044619

These expansions were produced by raising the temperature of each specimen 180° Fahr., or from 32° to 212°. Their lengths were generally 23 ins. The general result obtained is, that the expansion of the ordinary building stones differs but little from that of cast iron; and therefore that their combination in construction is not likely to be productive of effects injurious to the durability of the building; *Engineer's Pocket Book* for 1855-6 (Weale), p. 135. A useful list is also given at p. 66 (and for 1858, p. 44), from several authors, of the lineal dilatation of solids, between 32° and 212° Fahr., giving the decimals and vulgar fractions.

DILETTANTE. The Italian term for a lover of the Fine Arts, is almost synonymous with 'amateur', but does not imply so much practical knowledge. To the Society of Dilettanti in London, architecture is indebted for the collection of drawings, partly described in their *Report*, 4to., London, 1814, and in the

ARCH. PUB. SOC.

ANNALS OF THE FINE ARTS, iii, 478, of which they have published or caused to be published *Ionian Antiquities*, 3 vols., fol., London, 1769, 1797, and 1840; *Unedited Antiquities of Attica*, fol., London, 1817; which latter has been translated into French by Hittorff, fol., Paris, 1832; and PENROSE, *The Principles of Athenian Architecture*, fol., London, 1852.

DILLE, see GARNIER (JEAN CHARLES).

DILENIA SPECIOSA, or PENTAGYNA (*pinney*), is a stately forest tree of the East Indies, common on the face of the Western Ghats, in Coimbatore, and Gualpara; and in Tavoy it is called *zimboon*. The wood is said to be exceedingly strong and durable, even underground. It is believed to be the tree which furnishes the *poon* spar, valuable for shipping purposes, though *CALOPHYLLUM inophyllum* has hitherto been considered to be the tree. *BUILDING NEWS Journal*, iii.

DILWARRA in Ajmeer, see DAILWARRA.

DIMERTZOV ( . . . . ) erected 1808 the new arsenal and the church of S. Sergius at S. Petersburg.

14. DIMINISHED ARCH (Fr. *arc surbaissé*). An arch less or lower than a semicircle, the centre of the curve being situated beyond the chord of the arc or line of the springing.

2. DIMINISHING RULE. A board cut with a concave edge, by which to ascertain the entasis of a column, or to set out its curvature.

1. DIMINISHING STILE. The term used more especially in a glazed door, where the upper part of the stile at the glazed portion is of a less width than the lower part, into which the middle rail, etc., is framed; as figs. f and g, s. v. Door.

DIMINUTION OF A COLUMN. The reduction of the diameter of a column as it ascends. Until the discovery of the real nature of the Greek ENTASIS, the shafts of modern pillars have been diminished since the epoch of the Renaissance sometimes from a quarter, and sometimes from a third, of the whole height of the shaft; the latter having been prescribed by PHILANDER (from his own measurements of ancient columns!) as the most graceful diminution. An example of diminution from the foot of the shaft, without entasis, is rare on a large scale, but the portico of the National Gallery in London may be cited. VITRUVIUS, iii, 2, gives a scale of diminution from the diameter at base, according to the height of the column; viz. in 15 ft. two-twelfths; in 20 ft. two-thirteenths; in 30 ft. two-fourteenths; in 40 ft. two-fifteenths; in 50 ft. two-sixteenths, and so on. The actual diminution in the column of Trajan is said by TAYLOR and CRESY, *Antiquities*, fol., London, 1821, ii, 35, to be 10 ft. 8-9 from 12 ft. 2-2, i. e. about two-seventeenths. But SCAMOZZI applied the above cited precept of VITRUVIUS to the different orders, having diminished the Tuscan column one-quarter of its diameter, the Doric one-fifth, the Ionic one-sixth, the Roman one-seventh, and the Corinthian one-eighth. A long article is given by CHAMBERS, *Essay*, 1st ed., fol., London, 1759, pp. 13 and 31, to the consideration of the diminution proposed by these authors; but it is remarkable that in following PERRAULT's decision "that if the real relations differ, the apparent ones will also differ", he omitted to recollect his own conviction, expressed p. 34, with regard to undiminished pilasters, "that the top of the shaft appears broader than the bottom of it"; to which may be added that the top of a tall cylinder, furnished with a cap, and even the top of a lofty tower, if the top and the base be really exactly equal, appear, at a reasonable distance from them, to be wider than the base; and at the point where the diminution of Renaissance columns commences, their diameter appears to be greater than at their base. The ancients attended to this optical illusion, when they inclined the axes of their columns placed on a circular plan, or at the angles of a building; the towers, the porticoes, and the tambours to several modern edifices, show the fault arising from a want of sufficient compliance with such precedents.

DINANT LIMESTONE, see MARBLE.

DINAS BRICK. A brick formed of nearly pure silix,

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used in South Wales, Lancashire, Chili, and South Australia, to line the inside of copper furnaces.

H. C.

**DINING-ROOM.** The apartment appropriated to the service of the later meals of the day. Notices of the arrangements made for this purpose by the Greeks and the Romans will be found under the articles *CENATIO*, *SIGMA*, *STIBADIUM*, *TRICLINIUM*, etc. The public dining-rooms, both in this country and on the continent, like the house dinner-rooms and coffee-rooms of English clubs and hotels, have no special features of importance beyond that which would be given in a good country residence: and on the continent the private *salle-à-manger* is often little more than a vestibule. The Romans could afford in their villas a dining-room to each aspect, west perhaps for the spring, north for the summer, east for the autumn, and south for the winter; but in England the north and west aspects are given in a villa to this room, because "it is not supposed to be used till a late period of the day", and thus what are called the more cheerful aspects are reserved for the morning and living rooms: besides which the north and east, perhaps injudiciously, are generally given to the offices. As sunshine in a furnished room does not appear to be considered generally desirable in this country, the occupants must decide whether the advantages of the most interesting view, of freedom from the noise of rain, and of coolness in summer, alloyed by the fault of exposure to wind and snow in winter, compensate for the disadvantages of want of sunshine on the view, coupled with the exposure of the room to the heat of summer, and the direct action of the winds that usually carry rain-clouds with them. The eligible aspects vary much in different parts of the country: Lancashire, Suffolk, and Sussex, for example, have each different rules for their guidance in respect to aspect. **ASPECT.**

The dining-room of a small house in this country should not be less than 14 ft. wide; in larger houses not less than 18 ft. In order to accommodate a greater number it should be as long as the character of the house will admit, and care should be taken that when the guests are all seated there is ample room for servants to pass round clear of the fireplace, sideboard, and all other projections. The height should be moderate, as excess of it is not favourable to mixed conversation. The great problems in planning a dining-room are rather to find a convenient place for the chimney than for the sideboard (the use of a hot water apparatus obviates the difficulty); and the means of easy communication with the kitchen, etc.; whether the house be large or small, the distance should be as short as possible, and the dinner never be carried through any other portion of the house. Opposite sideboards with mirrors assist considerably the handsome appearance of the room: the admission of daylight, however, renders such an expense almost useless in the day-time; and thus a knowledge of the hours at which the apartment will be mostly used is essential to the architect. If artificial light is to be employed, the whole decoration, and in some measure the arrangement, of the room may be entirely different from that to be adopted if the room is lit by windows. Where possible, the light should be so managed that no one sits in his own light, particularly the carver, to whom at the head of the table is confided the chief responsibility of the occasion.

The shape of the ceiling is of considerable importance, as the ventilation should be as perfect as possible; the best was said to be that of a groined vault, with no more rise than is sufficient to conduct scented and vitiated air to the exits of ventilation. Where an adjoining room does not serve as a buffet, there should be on each side of the sideboard a closet; one with a lift (if the kitchen is not on the same floor), or approached by a passage outside the dining-room if on the same floor; the other being used as a hot closet, and for occasional services. Wherever practicable there should be two doors to the room, one for the guests and the other for the servants, so that no mishaps may occur by collision between the two. Care should be taken that no door be made between the drawing-

room and dining-room, lest the smell of the dinner should penetrate to the former. That the dining-room should not open into any other room, is enforced in the interesting papers on the subject of this article, in *London, Arch. Mag.*, 8vo., London, 1834, ii, 228, iv, 147; the meaning of the recommendation being that the apartment should not be made, by any possibility, a passage-room.

**DINNER-ROOM**, see **BUFFET**; **SERVING-ROOM**; **SIDEBOARD**.

**DINOCHARES** and **DINOCRATES**, see **DEINOCHARES**.

**DINTZENHOFER** (**LEONHARD**), being 1687 in the service of the prince-bishop Lothar Franz von Schönborn, styled himself Chur-Maintz-und Bamberger Architect, in his edition of **DIEUSSART**, 1697. He is considered to have designed the *residenz* in the Petersberg at Bamberg, of which the two façades to the domplatz date 1702-7; the monastic buildings in the Michaelsberg; several private houses; the church at Banz, 1719; and the schloss Schönborn at Weisenstein, near Pommersfelden. 68.

**DINTZENHOFER** (**JOHANN HEINRICH**), presumed to have been the son of the preceding, was architect and stadtrath at Bamberg 1733, where he built the back wings of the Dominican monastery and of the Carmelite nunnery; besides Riboudet's house; the Langheimer Hof; and some other buildings. 68.

**DINZENHOFER**, **DIENTZENHOFER**, or **DIENZENHOFER** (**CHRISTOPH**), probably a near relation of the above, is said to have erected the Benedictinerstift at S. Margareth (Brzewnow) near Prague; and in the Kleinseite quarter, where he lived, of that city, the front portion of the S. Niklaskirche, commenced 1673, which was finished by his son, and the Dominican church of S. Maria Magdalena. The latter building, 1656-1709, could only have been completed by this architect, who died 20 June 1722, aged 67, and was buried therein. 20. 68.

**DINZENHOFER** (**KILIAN IGNAZ**), son of the preceding, was born 1 September 1690 at Prague, and is considered to have been incontestably the chief of Bohemian architects. After receiving a liberal education, and being a pupil of his father, he went, until the death of the latter, to Vienna, where he was received as '*polirer*' with much approbation by several of the leading architects. He then visited Venice, Milan, Florence, Rome, and Naples, France and England. On his return to Prague, the execution, on a plan which he had brought from Italy, of a house in the ground called the Zwerggarten in the Neustadt, established his reputation, and he executed the following works in the city, viz. in the Hradschin the Ursuline nunnery and church of S. Anna and S. Johann von Nepomuck; but **SCHALLER**, *Beschreibung der Stadt*, 8vo., Prague, 1794, i, 315, states that the church was begun 15 Oct. 1720, and finished 1728, by a Johann Dienzenhofer: in the Kleinseite, the continuation or rather the back portion of the church of S. Nikolaus, of which the front had been erected by his father for the Jesuits; and the renewal of the church of S. Thomas: in the Altstadt, the abbot's residence and the fine church of S. Nikolaus accompanying it, for the Benedictines; the church of S. Bartholomäus and the convictorium accompanying it, for the Jesuits; and the seminary near the church of S. Wenzel: in the Neustadt, the church of S. Katharina and its accompanying Augustinian convent, which are ascribed to the same Johann Dienzenhofer by **SCHALLER**, ii, 33; the church and convent for the Elisabethinerinnen; the nunnery in the Heinrichsgasse for the Celestines; the church of S. Johann von Nepomuck in Skalka, commenced 1730 and finished 1749, by the same Johann Dienzenhofer, according to **SCHALLER**, iv, 105; and the church of SS. Peter and Paul, called the Zde-raser-kirche, together with the adjoining building, called the probstei of the knights of the Holy Sepulchre; and the emeritenhaus with the church of S. Karl Boromäus, ascribed to the same Johann by **SCHALLER**, iv, 111: to these might be added the Spanische saal in the Schloss, with the Langer, and

other houses, excepting the Piccolomini, afterwards Nostitz palace, in the Graben quarter of the Neustadt; and the Goltz, afterwards Kinsky palace, in the Altstadt markt; both of which, although designed by Dinzenhofer, were executed by Anselmo Luragho. Outside of Prague the former also erected the invalidenhaus; the Benedictine establishment at Policz; the S. Klemens-kirche at Wodolka; the Augustinian establishment and church at Rozow near Czitolib; the Jesuit residence at Liebeschitz, and at Tuchomierczic; the highly praised church at Kladrau, "of hewn stone in a Gothic style"; the pfarr-kirche of the Kreuz-herren at Carlsbad; the Marien-kirche at Nitzkow or Nitzow near Planitz, which he considered to be his best work; the church of the Jesuits at Klattau; and the Benedictine establishment and church at Braunau (sometimes written Brzewnow). He died 17 December 1752. A portrait engraved by Saltzer is in the *Abbildungen Böhmischen, etc., Gelehrten*, etc.

The JOHANN mentioned herein is called by SCHALLER, ii, 33, a son of Christoph, but other writers ascribe all the works to KILIAN. 20. 68.

DIOPTRA (Gr. *διόπτρα*; either an instrument to see through, as in the sense of the science of dioptrics, or as having double sights). One of the instruments stated by VITRUVIUS, viii, 6, to be used by the Roman engineers in planning the water supply to dwellings. SUIDAS, *sub voce*, describes it as a mechanical contrivance by which "geometricians ascertain the heights of towers when at a distance." It was probably a sort of quadrant. VITRUVIUS, however, says he prefers an instrument called by him 'chorobates', which appears to have been a long level furnished with sights, two plumb bobs, and a long groove at the top which was filled with water to serve much the same purpose as the spirit bubble in modern levels. A very curious treatise on the dioptra by HERO ALEXANDRINUS, has just been published in the *Notices et Extraits des Manuscrits de la Bibliothèque Impériale*, 8vo., Paris, 1858, xix, from a collation of a manuscript in that library with one at Vienna. At pages 180-81 are plates from illustrations in the original MS., and also the editor's and Venturi's restorations. A. A.

DIOPTRICS. That branch of the science of optics which treats of refracted rays and their union with one another, in passage through various media, as air, glass, or water. ANACLASTICS. 4.

DIORAMA. The name given not only to a picture of large size that underwent repeated changes by the operation of modified light on its transparent and semi-transparent surface, and by the intervention of opaque and of coloured materials,—but to a building in Paris, afterwards in London, and subsequently in many other towns, erected for the exhibition of the picture, or rather of two such pictures almost simultaneously. The edifice constructed in London 1822-3, under the direction of Messrs. Morgan and Pugin, is given in BRITTON and PUGIN, *Illustrations of Public Buildings*, 8vo., London, 1825, i, 66. It consisted of a circular room, 40 ft. in diameter, for the spectators, with timbered sides, having about a fifth of its circumference open. This room was enclosed by a circular wall, open for about a third of the circumference, and worked on a centre under the floor. When moved to the right the open fifth faced a large picture room, divided by a screen from another similar picture room (each 72 ft. long and 42 ft. high, the size of the picture, by 30 ft. deep), which faced the spectators when the room was turned to the left. The picture was placed about 90 ft. from the furthest point of the moveable room. The arrangement of the entrances was better contrived than that of the screens which had to intercept a view of the ends of the pictures.

DIOS (PEDRO DE), called Pedro de DEUS TAMBER and Pedro de VITAMBE. He died between the years 1065 and 1067, and was buried in the church of S. Isidoro at Leon, which he had rebuilt about 1063 in a Romanesque style. On a high tomb in the nave was the following inscription: Hic

ARCH. PUB. SOC.

requiescit Petrus de Deo qui superædificavit ecclesiam hanc: iste fundavit pontem qui dicitur de Deus Tamen: et quia erat vir miræ abstinentiæ et multis florebat miraculis omnes cum laudibus prædicabant: sepultus est hic ab imperatore Adefonso et Sanctia regina. 66.

DIOSCURI (TEMPLE TO THE), *i.e.* Castor and Pollux (Gr. *δῑόσκουροι*, progeny of Jove). BRAUN, *Ruins and Museums of Rome*, 12mo., Brunswick, 1854, presumes that a temple was dedicated to them upon the south-eastern boundary of the Forum at Rome: and adds that the three magnificent pillars, generally attributed to the temple of Jupiter Stator, and still standing, belonged to the side facing the Palatine. The only proof offered in support of this supposition, not fewer than twenty names having been already bestowed upon these columns, is the statement in the MONUMENTUM ANCYRANUM that the basilica Julia was situated between the temple of the Dioscuri and that of Saturn.

The temple in question was near that of Vesta (DIONYS., vi, 13; MARTIAL, i, 34), and near the Lacus Juturnæ (OVID., *Fasti*, i, 707). In later times, when Caligula brought forward the front of his palace from the Palatine, he made this temple its vestibule, and called the Dioscuri his gate-keepers (SUET., *Calig.*, 22; DION., lix, 28). From an inspection of the ruins of the Vesta and of the vast pile which, still projecting from the Palatine, was doubtless the work of Caligula, it may be supposed that this temple must have stood further back, behind the three celebrated columns, which must have been those of the Curia Julia, as this building, like the basilica Julia, was erected on the Comitium (PLINY, xxxv, 10; DION. CASS., xlvii, 19; MON. ANCYRAN.) and had a chalcidicum attached to it. This conjecture is further supported by the fragments of the Capitoline stones marked 'Basili Julia', and those of another piece, which show a building with an attached portico, corresponding exactly with the locality of the three columns. As the temple of Saturn projects before the basilica Julia, standing in fact at one angle of it, the latter may very properly be said to be between the temples of Saturn, and of Castor and Pollux. A. A.

DIOSPOLIS MAGNA in Egypt, see THEBES.

DIOSPYROS. The name of the genus of trees supplying the black ebony of commerce.

D. EBENUS yields the black ebony of the Mauritius, which is sent in round sticks seldom exceeding 14 ins. in diameter; this is the blackest and finest in grain, as well as the hardest and most beautiful of the ebony woods. The logs are preferred when about 6 ins. in diameter, long, straight, and free from bark, white wood, cracks, and worms.

The next in quality is the East Indian ebony, supplied by D. EBENEASTER, of Ceylon (*Kadum berriga*, in Cuddapah, a striped wood having a light brown colour; 71.); and D. MELANONYLON, of the Coromandel coast: it is shipped mostly from Bombay and Madras, in logs from 6 to 20, and even sometimes 28 ins. diameter, and also in planks of about 16 ins. of a fine uniform black. As it is much affected by the weather, European cabinet makers seldom use it except in veneer.

D. HIRSUTA (MOORE, *Cat. of Ceylon Plants*), Calamander or Coromandel wood. The produce of Ceylon and the coast of India; it is shipped in logs and planks from Bombay and Madras. The figure is black, and shaped between that of rosewood and zebra wood, on a chocolate-brown ground. It is a very handsome furniture wood, and turns well. Three varieties are named by LAIRD. A false Coromandel wood has a black ground, either striped, mottled, or dappled with light yellow, orange, or red. They are called *Kadum berriga* and *Omander*. The handsomest pieces are used for furniture, but it is inferior to the above.

A third black ebony is obtained from Africa. EBONY. BLACKWOOD.

D. CORDIFOLIA is a hard heavy wood, coloured dark brown, and difficult to work. Another species called *Ryanucha* and *Choomulloo* in Martaban, is used in house building. D. VIROGINIANA, Persimmon, is a hard and close grained wood of North America. D. LOTUS, *loto*, is an ornamental wood of Tuscany. HOLTZAPFEL, *Woods*, 71.

DIOTISALVI or DEOTISALVI, see PETRONI (D. DE').

DIPHILUS is recorded as the architect of a suburb and port to Stabiae, in an inscription preserved by CAPACCI, *Hist. Neap.*, 4to., Naples, 1771, ii, 480.



DIPLINTHIUS (Gr. *δῖς* and *πλῆθος*, a double brick).

VITRUVIUS, ii, 8, when writing of the building regulations of Rome, states that "the public laws do not suffer walls to be built more than a foot and a half in thickness in a public place (*loco communi*), that space may not be wasted, but brick walls (*lateritii*) a foot and a half thick cannot bear more than one story (*contignatio*) unless they are two or three bricks thick." As Roman bricks are hardly ever found under a foot long, this passage seems self-contradictory; in fact, it reads as it stands, 'a wall a foot and a half thick will not do its duty unless it is two or three feet thick.' That the thickness of a wall should be limited to save space is intelligible; but it seems difficult to understand why a wall 18 ins. thick, especially if built with such bricks and such mortar as the Roman, would not amply suffice for more than one story. PLINY, xxxv, 49, says, "in Italy also there are brick walls, as at Arretium and Mevania; but in Rome such edifices are not built because a wall a foot and a half thick will not bear more than one story." Further on in the same chapter of VITRUVIUS is the direction to place a 'structura testacea', burnt materials, at the top of the wall under the tiles, to prevent the wet soaking down should a tile be blown off. It seems probable from this that the 'lateritius paries', alluded to in this instance by both these authors, was a wall of *unbaked* brick, and that the Roman law was passed to enforce the use of *burnt* bricks in the city to save space. The passage would then mean "an 18 in. wall of *burnt* brick will carry more than one floor, but if of *unburnt* brick the same must be two or three bricks thick to bear such weight; and as this will waste space it is not permitted." Diplinthius therefore probably means a brick of double the usual length, to ensure a good bond; such as Wren is known to have used in the cone of S. Paul's cathedral, London. TRIPLINTHIUS.

A. A.

DIP PIPE. The pipe passing from the watercloset basin and conveying the soil through the trap to the soil pipe. In the woodcut in the article D TRAP, it is marked A, B.

A. A.

DIPTERAL (Gr. *διπτερος*). This word, properly meaning 'furnished with two wings', is applied in architecture to a temple 'having a double colonnade', on the flanks as well as the fronts. According to VITRUVIUS, iv, 12, dipteral temples were octastyle in front and back, "in pronao et postico", and have a double row of columns round the ades, or body of the temple; indeed they could not well have a less number in front, as otherwise there would hardly be room for the naos or cella. Some have supposed, with great probability, that they were occasionally decastyle: but the author expressly says "the hypæthral is decastyle". This last species, he states, has all the other parts of a dipteral temple except that in the interior are columns, double in height, standing removed from the walls so as to make a circuitous peristyle like a portico; and also that they (the hypæthral) are open to the air and without a roof, and there are entrance doors both in the pronao and posticum. He says there are none at Rome. Of dipteral temples he only mentions two; the Doric temple of Quirinus, and the Ionic of the Ephesian Diana. PSEUDO-DIPTERAL.

A. A.

DIPTEROCARPUS GRANDIFLORA. A wood of the East Indies: in Tavoy it is called *ain* or *aintha* and *kunneanphin*; in Chittagong, *sargetiah*; and in Mirzapore, *bigeedar*. It grows to a great size, and is used for beams and planks.

71.

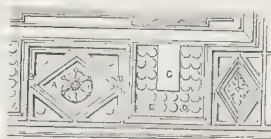
DIPTERYX ODORATA, Camara or Tonkin-bean. A not very plentiful tree from the river Essequibo, British Guiana. It is a fine, close-grained, hard, and very heavy, tough wood, and durable in an eminent degree. It is said that a portion of its timber, one inch square and of a given length, bears 100 lbs. more weight than any other timber in Guiana of the same dimensions. It is therefore well adapted for any purpose where resistance to great pressure is an object. It will square from 18 to 20 ins., and from 40 to 50 ft. long.

71.

DIRECTOR OF THE WORKS. BRITTON and BRAYLEY, *Westminster*, 8vo., London, 1836, 196, states that Henry de

Yeveley, mason, was director of the king's works at his palace at Westminster during the 39th and 40th Edward III, 1365-6, and received one shilling per day: during the same period, William Winchester, mason and "apparator operantium, director of the masons' work", was paid sixpence per day. The word 'apparator', however, would be better defined as 'foreman', and these authors do not give the original word for Yeveley's office.

DIREPTIONES VIARUM, in some copies DIRECTIONS. VITRUVIUS, iv, 3, directs them to be set out (*dividendæ*) on the lowest part of the corona in the lines of the perpendiculars of the triglyphs, and the centres of the metopes, the distribution



of the guttæ to be in like manner. The probability is that by 'viæ' the spaces, as A, between the mutules in the soffits of the cornices of the Doric order, are meant; and by 'direptiones' the lines, B, which

A. A.

mark out the panels usually made therein.

DIRIBITORIUM, the *δεριβιτήριον* of DION CASSIUS, *Hist.*, iv, and lix, who states that the edifice so called at Rome was dedicated by Augustus, after having been left unfinished by Agrippa; that it was the largest building that was ever covered with a single roof; and that it was in his time, A.D. 194-222, open to the sky, because the roof having decayed, nobody could frame a new one. PLINY, *H. N.*, xvi, 76, remembers that a beam of larix (larch?) 100 ft. in length and 18 ins. square, a relic of this roof, was left in the porticoes of the Septa (previously called Ovilia) in the Campus Martius. In addition to a hint given by DION CASSIUS, to the effect that this building had been used in the heat of summer as a theatre in the time of Tiberius, lexicographers have asserted that the diribitorium was constructed as the place for the inspection and pay of the Roman soldiery, and they cite as an authority CÆLIUS RHODIGIUS, fol. Geneva, 1620, vii, 6; who, however, expressly says he doubts the fact. SÆTONTIUS, *Claudius*, 18, says that it was used by that sovereign for the collection of the "annona" or state provision of corn when the Horrea Emiliana were burnt. The building was evidently in the Campus Martius, as appears from a comparison of LIVY, iv, 22, with VARRO, *R. R.*, iii, 2, and appears to have been intended to accommodate the people voting when the comitia were held. It is supposed to have been adjacent to the compartments for the several tribes, which were called sheep-pens, enclosures, prisons, or railings, according to the humour of the people. The crowd approached through barriers; they placed their votes in a ballot box, being watched by the 'rogatores' or poll clerks; the 'diribitores' (from whence the building probably took its name) or 'sorting clerks' collected and arranged the votes, which were finally examined and registered by the 'custodes' or check clerks.

A. A.

DISCHARGING ARCH. An arch, x, over a lintel, s, or any other support from which it may be desirable to take off the superincumbent weight and throw it on a more adequate support. Wherever it is possible, the arch should spring clear of the lintel, to obviate any settlement in the work over it from the decay of the latter when of timber, as at A; the manner in which the arch is too often built is shewn at B.



A. A.

In Mediæval buildings, an arch formed over the molded arch stones and frequently presented externally as part of the design, is called a relieving arch; and a discharging arch may occur above it.

DISCHARGING PIECE, STRUT, etc. A piece of timber so placed as to discharge any weight, in framing or shoring,

upon a better point of support. It is sometimes used for AUXILIARY RAFTER.

A. A.

**DISHING OUT.** The term applied to wooden cradling put up to form coved work, which is lathed and then plastered. The term is also used to a stone sink, where a channel or inclination is formed at the bottom of it to give a fall for water towards the waste pipe; to the quoin stone of bevel coping; and similar works. The term is more generally applied in the sense of 'hollowing out'.

A. H. M.

**DISINFECTANT,** see DEODORIZER.

**DISINTEGRATION.** The process by means of which a body composed of distinct parts loses its entire or integral state; and, by extension, the term is applied, somewhat incorrectly, to any great change in the mechanical structure of the substance or body, by means of which it changes its form, even when the elements of the substances comprising it are able to resume their original chemical state, after the determining cause of that change shall have been withdrawn. The changes superinduced by extreme heat, or by fusion, are illustrations of the latter condition; ordinary disintegration may be illustrated by the manner in which certain building materials fall to powder upon the removal of the cementing substances which held their ingredients together. The most powerful agent of disintegration, in the cases of the compounds of the earthy bases and the acids, that is to say of the compounds generally used for building purposes, is water; especially when it contains carbonic acid, sulphuretted hydrogen, or the salts of magnesia. These various agents are, in fact, able to form new and soluble compounds with the various bases; and as these new compounds are renewed when the waters giving rise to them are frequently removed, a disintegration of the whole mass necessarily follows. The gradual decay of building materials appears to be mainly attributable to a disintegration produced by the new chemical combinations, and by the displacements of the particles thus produced; but an excessive mechanical effort, such as frost, able to disturb the molecular condition, or the elasticity, or adhesion of the constituent particles of the substances considered, will equally produce the same results. Disintegration may, indeed, be produced by decomposition or by crushing; the indispensable condition being only that the change of state in the molecules should be such as to render impossible their subsequent reconstitution in their original form. Thus understood, the disintegration produced by fusion can only be considered to be temporary. Disintegration is singularly facilitated by galvanic action, which gives rise to rapid chemical decomposition. It is therefore essential to avoid introducing building materials in positions which may give rise to any such action. **BRARD. DECOMPOSITION. GALVANISM. ATMOSPHERIC INFLUENCE.**

G. R. B.

**DISPENSARY.** An institution for the supply of the poor with medical and surgical advice, and also with medicine, gratuitously. It is desirable in a building so appropriated to maintain perfect separation, by means of distinct entrances and waiting rooms, between the classes, and sometimes the sexes, attending for relief, which may be divided into three; 1, new patients; 2, surgeon's patients; and 3, physician's patients. Ready means of access between the rooms of the surgeon and physician should be provided, to facilitate consultation; and the patients of each, after receiving their prescriptions, should at once be able to present them at a distinct part of the common dispensary, and leave the building without again entering the waiting room. The ventilating and warming of the various apartments, as also the supply of hot and cold water for operations, cleansing utensils, and for baths, are of much importance. The following list, in addition to the above, comprises the various requirements of a dispensary, subject to such modifications as may be occasioned by want of funds or other reasons. Consulting rooms for the surgeon and the physician, with an inner room for the surgeon for operations; the dispensary, or room for dispensing drugs, etc., the access to which should be common

ARCH. PUB. SOC.

to each of the above named classes, and so placed that each class can receive medicine distinct from the others; a store for drugs; accommodation for the house surgeon and dispenser; a board room; a secretary's office; a private room for the physician; accommodation for the housekeeper and porter; conveniences for the patients and others; hot, cold, vapour, and other baths, with provision for the boiler and steam apparatus. Wards for the accommodation of patients, apartments for nurses, a museum, and a library, have been occasionally introduced. Plans of the dispensary at Brighton, 1850, by H. Williams, are given in the *BUILDER Journal*, viii, 30; and *ILLUSTRATED NEWS*, xiv, 144. A long description of the general purposes of such an institution are given in WHITEHEAD, *Hist. of Dublin*, 4to., Dublin, 1808, ii, 730-43.

A. H. M.

**DISPLUVIATUM.** A term used by VITRUVIUS, vi, 3, who, describing the five sorts of *cavedium*, says "*displuviata autem sunt in quibus DELIQUAE arcam sustinentes stillicidia rejiciunt*"; and he adds that "this sort of roof is useful in winter habitations, because the *COMPLUVIUM* does not impede the light of the chambers, although it has the inconvenience that the down pipes do not always carry away the waters from the gutters quickly enough, but get choked up, and injure the inside work and the walls themselves." From this it seems clear that, being the reverse of the usual ancient roofs, which threw the water inside the house into the central court or atrium, it sloped towards the external walls and threw the rain outwards. Q. DE QUINCY, *Diet.*, s. v., supposed that it was entirely open to the air; but if this were the case persons could not pass from room to room without getting into the rain. A rare example is illustrated by MAZOIS, *Ruines de Pompeii*, fol., Paris, 1812, ii, 48, pl. 11, figs. 2 and 4.

A. A.

**DISPOSER,** see DEVISOR.

**DISPOSITION.** A word frequently misapplied in the sense of distribution, and that word is equally often employed instead of disposition. In criticising a picture, persons acquainted with the force of the terms that they use, discriminate between the disposition of the figures with their accessories; and the distribution of the light, shade, and colour: so in architecture it should be remembered that while distribution refers to the management of chiaroscuro and embellishments, disposition implies the arrangement of rooms in a plan, of main features in an elevation, of supports and voids in a section. In fact the English sense of disposition is the same as that of the '*dispositio*' (Gr. *διαθεσις*) of VITRUVIUS, i, 2, who uses *dispositio* as the consideration of what is due to the position and means of the client; *ordinatio* as the arrangement of the general dimensions for each part of the work; and *dispositio* as the management in plan, elevation, and perspective view, of those parts. *Detached Essays*, POCOCK, *Elements of Design*. 6. 25.

**DISSCHINGTON** (SIR WILLIAM DE), sheriff of Fife in Scotland, and steward of the king's house, was "master of work" 1368 of the church of S. Monan in Fife, a not unpleasant example of the Decorated or Middle Pointed style: *BUILDER Journal*, 1851, ix, 53. In the *Registrum Magni Sigilli Regum Scotiae*, fol., London, 1814, his name appears as witness to charters dated 1364-5, p. 36; 1365-6, p. 44; 1366-7, pp. 46, 47, 50; 1369-70, p. 64; 1370; and as the subject of charters dated 1365-6, p. 44; 1368-9, p. 62; 1369-90, p. 68.

**DISSECTING ROOM.** An apartment used for the purpose of studying anatomy, especially by means of the dissection of the human frame. A room for such a purpose requires to be constructed with due regard to certain proprieties, cleanliness, light, temperature, and ventilation. It should be near the dead house (a communication with which may be desirable), and should be either detached from the main building or connected with it only by a passage; if within the building, it should be so placed that the ceiling or roof can open to the external air; a skylight or lantern being the best means for the purpose. Its position in reference to the various apartments in the building must be regulated according to circumstances; and, where used

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in connexion with a lecture room, it should be within a convenient distance. The requirements of such a room are, a plentiful supply of hot and cold water; side tables with shelves to hold instruments, etc.; tables, often covered with lead, of various sizes, one or two being wide enough to hold a body with the arms and legs extended, of enameled slate or marble, slightly inclined to allow the oily and other liquids to fall into grooves or channels sunk at the edges, and to be conveyed away by means of pipes, or into vessels if they are to be preserved. Bodies being frequently put into postures for the purpose of dissecting them with greater facility, and also for that of sketching them, means should be provided for keeping them in the required attitudes, such as ropes and pulleys from the ceiling, wedges, and flaps capable of being raised or depressed. The floor, and also the sides of the room up to a certain height, should be of some material, as slate or stone, which can be readily cleansed, and means should be provided to prevent the entrance of flies and vermin. A retiring room, with washing closets supplied with hot and cold water should be contiguous. A moderate degree of temperature is desirable, and perfect ventilation is most essential, the foul air being carried off at as great a height above the surrounding houses as possible. ANATOMICAL THEATRE. A. H. M.

The arrangements at Trinity college, Dublin, consisted of a public and private dissecting room, with suitable apartments and lofts for washing and drying preparations: the public dissecting room was furnished with twenty tables, at each of which two students could be placed.

**DISSENTER'S** (frequently called **DISSENTING**) **CHAPEL**. A building duly certified for the accommodation of a meeting, congregation, or assembly for religious worship, with unfastened doors, of Protestant dissenters from the 34th, 35th and 36th, and from parts of the 20th and 27th of the Articles of Religion of the Church of England, at which there are present twenty more than the immediate family and servants of the person in whose house or upon whose premises the meeting is held. Such an edifice is defended from riotous demolition by the acts 1 William III, c. 18; 10 Anne, c. 2; 1 George II, c. 5; 22 George II, c. 30, and 36; 19 George III, c. 44; 31 George III, c. 32; 52 George III, c. 155; and 53 George III, c. 106, and is a public building within the limits of the Metropolitan Building Act. The primary idea of a dissenter's chapel was extreme simplicity as a meeting-room, of various plan, generally oblong, but polygonal in some Methodist chapels, designed solely as an auditorium or lecture hall, with stairs at one end to galleries, and a shallow recess, if any at all, for the table; while the simplicity above named has been exchanged in many cases for imitations of the churches and chapels of past times. In chapels built of late years for the different denominations of Protestant dissenters, the Independents chiefly, if not solely, seem in some cases to have preserved the custom of placing the table near the centre of the edifice.

**DISTEMPER WORK** (It. *tempera*; Fr. *détrempe*). A method of applying colour to large surfaces of stone, brick, plaster, woodwork, etc., in buildings: which, having been the chief means (stencilled or otherwise) of internal decoration until the general use of oil paints about the middle of the eighteenth century, and until the introduction of paper hangings, is still retained as a cheap mode of giving colour when the latter is thought too expensive or inappropriate.

The addition of other materials than the whiting only, to produce tints, is all that is required to cause painters to change the name of this method from 'distemper' to 'colouring'. The colours are generally opaque earthy substances, such as ochre, umber, verditer, etc., mixed with more or less of whiting to give body. With the water is mixed some animal gelatine called size, dissolved in warm water, the use of which is to act as a binder, and prevent the colours rubbing off. Colouring is sometimes done twice, but the lower coat often 'comes up' and looks what

the plasterers call 'sheary'; while one coat only will sometimes sink into the plastering so as not to cover well. The best way is to give the walls a coat of clearcole first to 'stop the suction'. When white alone is used, a little black is added to take off the intensity of the white. Distemper dries rapidly, and does not possess the gloss of oil paint: when required to be renewed, the old must be well washed off with water. It cannot afterwards be limewhitened with a satisfactory result, as the limewhitening subsequently turns yellow. Distemper with various colours is also used in paper staining, and in scene painting. **CLEAR-COLE. LIMESWHITE.**

**DISTRIBUTION**. A word frequently used instead of **DISPOSITION**, under which article it has already been explained as the proper term for the arrangement of chiar-oscuro and embellishments in building. The application of secondary features, such as windows, etc., to a previously composed mass or combination of masses, is **DISPOSITION**; the introduction of subordinate parts or details and their ornaments, such as string courses, panels, bassi-rilievi, pictures, etc., is **distribution**; which combines with disposition to form **COMPOSITION**. Thus it is reasonable to speak of windows as disposed in pairs or as triplets; but of their plain and enriched moldings as properly, or otherwise, distributed. Some books, having considerable reputation, treat of disposition as if it were equivalent only to elevation, while distribution specially implied plan: but this is an error caused by deference to the French use of the words. The 'distributio' of VITRUVIUS, i, 2, corresponds, however, in part to the French use of the word. Having stated that in Greek it is termed *οικονομία* (translated in the *Detached Essays*, POCOCK, *Elements of Design*, by 'stewardship'), it is explained as "an advantageous use of the materials and site, and a frugal expenditure in the execution. This will be observed if the architect does not ask for those materials which cannot be found or procured except at great expense."—"Another branch of distribution is when the buildings have to be arranged according to the wants of the head of a family, or in proportion to the wealth, or to the dignity of elegance of the owner;"—"in short, the arrangements of buildings must ever be suited to the wants of the persons requiring them." 6. 25.

**DISTRICT CHURCH**. The name of an edifice belonging to the Church of England. The endowment of a district church is something *sui generis*, having been created by some church-building acts of Parliament which interfered with the canon law. Thus the Act 1 and 2 Vict., c. 106, s. 124, defines a benefice, as a parish, perpetual curacy, donative, endowed public chapel, parochial chapel, and chapel or district belonging or annexed to any church or chapel. Unless an endowment has been formed from some other sources, it is generally at first what would be called a chapel of ease or a parochial chapel, endowed by consent of the incumbent with part of the revenues of a district of a parish until his death, or by his consent an earlier period, after which the whole revenues of the district are affixed to the chapel, which becomes nearly or altogether independent of the mother church and its incumbent, and then ranks as above.

**DISTRICT SURVEYOR**. An officer appointed to carry out the provisions of the Metropolitan Building Acts, in any of the districts within the limits of those Acts. DONALDSON, *The Office and Duties of a District Surveyor*, 8vo., London, 1856.

**DITERICH'S**, also called **DIERTRICH'S** (FRIEDRICH WILHELM), born 1702 at Uelzen in Lüneburg, became 1717 the pupil of M. H. Böhm at Berlin, near which city he superintended the erection of the schloss at Schwet 1721-3, from the design of his master, whose other commissions were subsequently entrusted to him. In 1722 he was bau-inspektor of the kurmärkische kammer; 1726-7 built for von Viereck the new church at Buch, two miles from Berlin; and 1734 restored S. Peter's church in that city after the fall of its tower. From 1732-6 he erected the circular Bohemian church and

several private works, inclusive of Schickler's (Behrend's) house 1735 in the Dönhofsche platz; and finished on a new design the Reussische pallast commenced by Stolz in the Leipziger strasse in the Friedrichstadt suburb. In 1737 he was made bau-direktor, in which quality he directed the execution of the Weissenberger schleuse; restored the Gertrauds hospital church also in Berlin; built the orangery at Potsdam; began the schloss Sanssouci 1745; and erected for Zinnow the pallast Amalia in the Neustadt suburb, besides another in the Linden strasse. In 1752 he resigned his employments, and died 1784 at his estate, Orpensdorf, near Stendal. NICOLAI, *Nachrichten in die Beschreibung von Berlin*, 8vo., Berlin, 1786, p. 138. 68.

DITRIGLYPH. This term appears to have been originally applied to the space between two triglyphs; but at least as early as 1825 it is also explained as the interval between two columns, admitting two triglyphs in the entablature, used in the Doric order, and this acceptance has recently usurped the place of the earlier one. 1. 2. 4. 6. 23.

DITTON (JOHN DE) was appointed clerk and keeper of the king's works at the palace of Westminster, and at the tower of London, 13th Edward II, 1320; as stated in the "*Originalia*" quoted by BRAYLEY and BRITTON, *Westminster*, 8vo., London, 1836, p. 137.

DIVERSORIUM. This, or taberna diversoria, appears to have been used by the Romans as a name for a lodging, hired or gratuitous. CICERO, *Ep. ad Fam.*, vii, 23, wished to buy one as a residence at Tarracina; but SIDONIUS APOLLINARIS, *Ep. ad Dom.*, ii, 2, mentions it as a living room looking north, in which the heat of summer could be avoided. Speaking of the buildings, for different purposes, which found a place in the area surrounding the early churches, BINGHAM, *Origines*, 8vo., London, 1840, ii, 482, observes that "EUSEBIUS adds to these ἀνακαμπτήρια, which MUSCULUS translates deambulatorii recessus, taking them, I presume, for 'walks about the church'. But VALESIIUS more properly renders them 'diversoria', for they seem to mean the 'little hospitals' or 'houses of entertainment for the poor and strangers'; which are the cellulae, 'the little cells' or 'lodgings', if I mistake not, spoken of in the aforesaid law of the Theodosian code. And perhaps they might serve as lodgings also for such as fled to take sanctuary in the church; for these might neither eat nor lodge within the church, but only in some of these outward buildings." Similar 'ospizi' are attached to the churches to which pilgrims resort in Italy to the present day; a good example is that of Sta. Trinità dei Pellegrini at Rome.

DIVIDERS. The popular name for a pair of mathematical COMPASSES.

DIVIDICULUM. This word has been explained in SMITH, *Dict. Ant.*, p. 114, as the castellum, château d'eau, or conduit house to the ancient aqueducts, and the building called the trophies of Marius is cited as an example. But it is clear from FÉSTUS, s. v., that this is a mistake, for he says "the ancients called those things dividicula which are now the castella from which every man conducts the water out of a public stream into his own ground (fundus)." In a country like Italy, where so much depends on irrigation, the right to take water from running streams is often the subject of litigation. At the present day, in that country, the water is generally taken from the stream by a long conduit or trough, generally of stone, in which it is headed back so that the cattle may drink from it at all times. For certain hours each proprietor is in turn entitled to open the sluices at the end of the troughs to irrigate his crops. Exactly a similar arrangement to the present is figured in RICH, *Illust. Comp.*, s. v. Canalis, taken from an antique picture, and probably the form has never been altered from the earliest periods to the present day. The word is evidently derived from *à dividendo*, because the dividicula gave each proprietor in turn his share of the water. A. A.

DIVODURUM. The ancient name of Metz in France.

DIZACA. The ancient name of Ani in Armenia.

ARCH. PUB. SOC.

DJAMA, see JAMA.

DJEBEL EL BARKAL in Egypt, see MOUNT BARKAL.

DJEBEL SILSILEH in Egypt, see SILSILIS.

DJERASCH in Syria, see GERASA.

DOBSON (.....). Speaking of Lord Bacon's villa at Verulam, AUBREY, *MS. Survey of Wiltshire*, ii, 229, in the Royal Society's library, observes, "no question, but that his lordship was the chiefest architect, but he had for his assistant a favourite of his (a S. Alban's man), Mr. . . . Dobson (who was his lordship's right hand), a very ingenious person (master of the alienation office)", who was father of the celebrated painter William Dobson, according to DALLAWAY'S WALPOLE, *Anecdotes*, 8vo., London, 1826, ii, 251. W. R. C.

DODD (JOSEPH) erected 1754, the town hall at Berwick-on-Tweed, containing the exchange, cells for criminals, town-hall 60 ft. long and 30 ft. wide, assembly room 47 ft. long and 23 ft. wide, with over all the gaol of the town, and a turret 150 ft. high. BRITTON and BRAYLEY, *Beauties* (Northumberland), 8vo., London, 1812, p. 237.

DODECASTYLE. The term adopted from the Greek language for a rank of twelve columns or pillars facing the spectator.

DOEM (JOHAN VAN DEM) commenced 1321 the tower of the west front of the cathedral church of S. Martin at Utrecht, completed 1382, according to an inscription given in DE JONGE, *Bijdrage*, fol., Amsterdam, 1847, p. 17.

DOERFLINGER (BALTHASAR LEONHARD) died 1716 at Innsbruck, where he was kaiserlich königlich rath and hofbauschreiber. His son JOSEPH HIAONYTH built 1729-32 the Johanniskirche in that town, and died there 1764. 68.

DOG. The name given, in metal work, to any very small piece projecting so as to enter a hole in the material to which the whole piece is to be applied, and assist in keeping it in its place: thus it is used on the under side at either end of a cast iron girder: the pivot of a centre hinge is called a dog, Fr. *croquedine*. DOG-RIE; STUB.

DOGANLOU, in Asia Minor, see MIDÆUM.

DOG IRON, called COB IRON in Shropshire and some neighbouring counties. A cradle for sea coal is frequently mentioned in old inventories as belonging to the chief rooms in superior English houses; from the habit of steadying each end of this cradle by a heavy standard, called a dog, the name has been perpetuated in some of the showy grates made at the present time, though the grate is no longer so supported. Andirons were dogs, that could be lifted easily, attached to the bar, brand, or brand iron, which prevented the wood fuel from resting entirely on the floor: creepers were smaller irons, placed for the same purpose between the chief andirons. ANDIRON; BAR STONE; CAT-STONE. 23.

The term is also applied to irons used by sawyers to support round timbers in the pit while being sawn. They are sharp at each end; generally somewhat chisel shaped, so that they may be driven into the tree as well as into the side of the saw-pit; and the end portions are bent at right angles to the chief or central part, and often in planes at right angles to each other. A. A.

DOG-KENNEL, see KENNEL.

DOG-LEG STAIRS. Stairs having no well-hole, the outer strings of the half flights being framed into one newel at the landing, or at the turn of the stairs. The hand rail of the lower half of the flight mitres on to and continues down the string of the upper half, till it finishes against the newel. A. A.

DOG NAILS. These nails differ from clout as they have raised heads, and as the shanks leave the under sides flat. Dog and clout nails used both to have round shanks; while rose nails, which are now very little heard of, had square shanks like clasp nails, and rose heads like dog nails. A. A.

"These are proper for fastening of hinges" (such hinges as cross-garnets must be meant) "to doors; for (if made right) they will hold the hinge close without the heads flying off, or without botching, by putting leather between the head and the



hinge. The sizes are 9, 12, 20, 25, 30, 40, 60, 80, and 120 lbs. a thousand"; NEVE, *Dict.*, 1736.

**DOG'S EARS.** An old term used by workmen for ACROTERIA.

**DOG-TIE.** An old name for a CRAMP. In the King's Remembrancer's Office, a 'Memorandum of a great part of the works ordered and executed in the Palace of Westminster', etc., 1307-10, shows that the little hall had its walls in many parts strengthened and embattled, and that the upper masonry was bound together with large iron ties with tinned heads, on account of the great weight and size of the timbers. "The original words are as follows, 'cu' grossis cavillis ferreis cu' capitib' stagnimatis'. The words 'grossis cavillis ferreis' evidently allude to what artificers formerly called horse-ties, but which are now known by the appellation of dog-ties. We may assume that the outer parts of those mentioned above had been tinned to prevent oxidation"; BRAYLEY and BRITTON, *History, etc., of Westminster*, 8vo., London, 1836, p. 113. So also a dogge of iron is translated 'harpon de fer pour retenir et arrester un poutre', i. e. beam, by COTGRAVE, *Dict.*, fol., London, 1650.

**DOG-TOOTH ORNAMENT** (Fr. *dent de scie*). A very inappropriate name sanctioned by long usage, but now generally abbreviated to 'tooth ornament', for a sort of square flower consisting of four leaves radiating from a raised centre; or as RICKMAN, *Attempt*, 1845, p. 114, observes, for a pyramid having the sides carved. Such flowers, generally in contact, but sometimes put at regular distances (like the ball flower), were placed in hollow moldings, and consequently are several times repeated in rich suits of moldings. This decoration appears in every style of mediæval art, being chiefly characteristic of First Pointed work, where it occurs in great abundance on doorways, windows, arches, etc., though occasionally it is used in late Romanesque work, and is to be seen in a Tudor arch at Lichfield cathedral. It may be traced, if not from the simple nail-head (as by RUSKIN, *Stones*, 8vo., London, 1851, i. 260, who terms that ornament 'the plain dogtooth'), at least from the star, through the flattish flower seen at Lincoln, Herringfleet, Patricksbourne, and Canterbury in Norman work; at Hargrave, Ratcliffe, Cuddesdon, and Hasely in Transition work; and at Lincoln, Chipping Warden, Peterborough, Stowe, Binham priory, Dunstable, and S. Cross in First Pointed work, until it is lost in the foliage of the Second Pointed, as at Southwell and Cherrington: examples of these are given in the GLOSSARY, pl. 112, 115, 119-124, which notes that "this enrichment is seldom found in the early French work of Normandy or other parts of France; and where met with it is but sparingly employed, as at the cathedral, Lisieux."

An early example is seen in the doorway to the tower of Tugby church, Leicestershire; another is the circular-headed arch called the priests' doorway, Wennington church, Essex, as shewn in the cut; and a third on each side of the shaft to the doorway of the Jews' house at Lincoln.

This ornament in its simple form appears in the abacus of one of the capitals in the cloister at Monreale, 1182-94; and it is noted by WIGLEY, paper read at Royal Inst. of Brit. Arch. March 10, 1856, 105, as occurring in the jambs of the windows of the little church of the Cenaculum at Jerusalem, now known as the mosque of the tomb of David, erected early in the fourteenth century; and he assigns the origin of the ornament, as well as of the ball flower, to the Holy Land, the types being obtained from the cyclamen or gazelle's horn, and the red anemone. The use of it in Western architecture 1090-1187, curiously corresponds with the period of the first crusades.



"The Early English dog-tooth is found in Italy in many cases. Thus in the south door of the town hall at Perugia (1333), it is used and set in a hollow exactly as in the Early English specimens; I have also found it on a door opposite the great inn at Terni; in the front of S. Fermo at Verona (1330) it appears as an edge-molding, and it also occurs on the cornice of a house in Vicenza", according to WILLIS, *Remarks on the Architecture of the Middle Ages*, 8vo., Cambridge, 1835, p. 196.

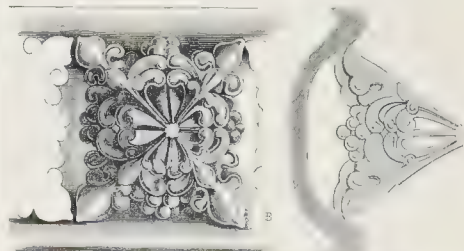


Fig. 1. Dog-tooth ornament from doorway at Perugia. Fig. 2. Dog-tooth ornament from cornice at S. Fermo.



Fig. 3. Dogwood beam. Fig. 4. Dogwood beam.

**DOGWOOD.** A wood of North America, obtained from the *CORNUS florida*.

It is hard, close grained, heavy, strong, and susceptible of a brilliant polish. The sap is white, but the heart is of a chocolate colour. The tree grows from 20 to 35 ft. high, and from 9 to 10 ins. in diameter; but generally it is found but a little more than half those sizes. Being liable to split, it should be well seasoned. The smaller kind is remarkably free from silex.

Dogwood, a species of *Bedfordia*, attains to a considerable size in Maria island, Van Diemen's Land. The wood is very richly and beautifully marked, and well adapted for all kinds of ornamental work.

The dogwood of Bahama does not attain any considerable size, but being generally crooked, it is well adapted for ships' timbers, though it is a rather soft, open grained, light, but evidently very tough wood. Dogwood is also the name of the *Piscidia erythrina*, a hard and durable wood of the West Indies. 71. 90.

**DOKOS** (Gr. *δοκός*, a beam). "The *δοκοί* were the principal timbers of the roof, but there was a considerable interval between them and the *θραύον* which was the *εἰς ἐμπρόκειαν στέρης* of PAUSANIAS." "The *συνιδωμα* served as the floor of this intervening space" between the lacunaria and the roof of a temple; according to the DILETTANTI SOCIETY, *Antiquities of Ionia*, fol., London, 1840, iii. 39. In that work *θραύον* is taken to signify the tie-beam, because the word has, as he thinks, some supposed affinity to the Lat. *transtrum*, although the latter clearly is derived from *trans*. But HESYCHIUS describes *θραύον*, s. v. as the boarding (*συνιδωμα*) above the coffer (*φανόματα*); anything above the *δοκοί*. In ARISTOPHANES, *Nubes*, 1479, where they commence pulling down the house of Socrates, *δοκός* seems to mean a rafter. In S. MATTHEW, vii. 3, and S. LUKE, vi. 41, the word may mean any beam.

A. A.

**DOL.** A city in the department of Ille et Vilaine in France.

Having once been a fortified place of importance, old walls and deep ditches are visible on all sides, but the glacis now form promenades. There are many old houses with projecting stories in the narrow streets, while the grande rue is wide and rather uniform. The houses (exhibiting arcades, of all periods down to that of the Renaissance, seeming to have belonged to older structures than the present, although one dwelling may date from the thirteenth century), are built to a great extent of the local dark coloured granite, which is occasionally whitewashed: a grey granite has been used for the church, formerly cathedral, dedicated to the Virgin and S. Sampson, which is perhaps the finest Pointed edifice in Bretagne, and is considered to have been strongly fortified, by TURNER, *Some Account*, 8vo., Oxford, 1851, ii, 168, who gives a view and plan, p. 190, of one of the arcaded streets. A plan, with external and internal views and details to scale, with a Renaissance tomb to Joseph and François James, that was executed 1507 by Jean Juste, in the north transept, are given by TAYLOR and NODIER, *Voy. Pitt.* (Bretagne), fol., Paris, 1845, ii, pl. 364, etc. From these the building, 231 ft. long and 56 ft. wide inside, appears to belong chiefly to the style *ogival primaire*, and to be cruciform in plan (divided exactly in half by the aisleless transept), with a square end and a large rectangular Lady chapel. The north tower rises only to the roof of the nave. The damaged western façade dates from the thirteenth to the sixteenth centuries. The low central tower has a trefoiled and pierced parapet; and there are two south porches. The details of the north porch are thought equal to any of the thirteenth century in Normandy.

The chief other buildings are the halle au blé, formerly a church of the Carmelites, which was erected in the eleventh century but altered and enlarged with the addition of a choir in the thirteenth or fourteenth century; there is no apse; and the nave has a wooden ceiling, while that to the transepts is of stone: the Romanesque maison des Plaids, or palais de justice; the collège communale; the civil, and the military, hospital; and the theatre. About a mile on the road to Hédé is the pierre du champ dolent, which is an upright stone of greyish granite 30 ft. high and 8 ft. in diameter. 50. 96.

**DOLABRA.** The Latin name for a species of hatchet, evidently having a long handle, as appears from the expression 'securibus dolabrique' in LIVY. The illustrations of a sort of battle-axe, given s. v. in RICH, *Illust. Comp.*, materially differ from those in SMITH, *Dict. Ant.*, who appears to consider it as a celt-headed instrument, except in the case of the hatchet-formed *dolabra pontificalis*. ASCIA.

**DOLACIO MEREMII.** This late Latin term is explained as 'the rough hewing and squaring of timber' by the SURTEES SOCIETY, *Priory of Finchale*, 8vo., London, 1837, pp. ccclv, 427.

**DOLCEBUONO** or **DOIZEBONO** (GIOVANNI GIACOMO) is mentioned under the date 27 June 1490, with G. A. Omodeo and F. di Giorgio di Siena, as having been elected (probably after the destruction of the work commenced by G. von Gratz of Strasburg, 'per conclusione de la fabrica del tiburio' of the cathedral at Milan) 'per ingignieri della dicta fabbrica ad componere et ordinare tutte le parte necessarie a costituire il dicto tiburio': which last word (suggestive of *tamburo* or else of *turgio*), see FIORILLO, *Geschichte*, etc., in *Deutschland*, 8vo., Hanover, 1815, i, 360, who gives that word from a document dating 1481 relative to this portion of the building) is explained as 'cupola' by FRANCHETTI, *Storia del Duomo*, 4to., Milan, 1821, pp. 17, 18, 143.

**DOLMEN**, said to be derived from *dol*, a table, and *men*, a stone. A species of Celtic building, supposed to be sepulchral, consisting, according to LUKIS (paper read 24 February 1853 at the Society of Antiquaries, *ARCHÆOLOGIA*, xxxv, 233), of a large stone entirely supported on two, three, or four erect and raised smaller ones; the sides being open, differing in this last respect from the *cistvaen*, which also is chiefly found with horizontal blocks. Various other names have been given to the dolmen; as *lichaven*, *trilith*, *Druids' altar*, and *quoit*. An otherwise

useful paper, showing how the term **CROMLECH** has been improperly applied to the dolmen with a spring under it, is given in the *GENTLEMAN'S MAGAZINE*, 1833, vol. 103, i, 12. Successive dolmens in contact properly form a cromlech: and compound cromlechs occur that are the result of the addition of successive dolmens to the eastward of the original structure; and sometimes of the further addition of lateral cists which were invariably joined to this newer portion, and sometimes, but rarely, communicate with the larger lengthened chamber. Thus, besides the examples in the cromlech called Dehus, in Guernsey, the best instance of dolmens occurs at Gav'r Innis, Morbihan, where the successive dolmens are continued to a very great length. The **DEMIDOLMEN**, also sometimes called *Druids' altar*, is, according to the first named author, a large stone partly supported on one or sometimes two erect and raised smaller ones, the sides being open; and he notices, besides the examples s. v. **CROMLECH**, the independent dolmens of Clun-quoit in Cornwall, Kils-coty house and Whispering Knights, adding that although common in England, Scotland, Wales, Ireland, France, etc., there are none in Guernsey: he specifies the independent demidolmen at Llanwnda in Pembrokeshire, another in Guernsey, and adds that there are numerous examples at the Morbihan. Dolmens are found in Spain and in Portugal, where they are called *antas*; a dissertation upon the subject by MENDOZA DE PINA is to be found in the Proceedings of the Portuguese Royal Academy of History, 1733. Illustrations of dolmens are given in the books named s. v. **CROMLECH**. **TABLE-STONE**.

**DOLOMITE.** A double carbonate of lime and magnesia, worked for the purposes of masonry, and burnt for lime. It effervesces with acids, but to a slighter degree than the carbonate of lime: its primitive form is a rhomboid, rather more obtuse than that of the pure carbonate: its specific gravity is about 2.86: the purest varieties are said to consist of

Carbonic acid	-	-	-	-	46.00
Lime	-	-	-	-	32.00
Magnesia	-	-	-	-	20.50
Oxide of iron	-	-	-	-	0.90
Water and waste	-	-	-	-	0.60
Total	-	-	-	-	100.00

Dolomite occurs generally in connexion with the carboniferous series; and under such circumstances has been met with in South Wales, near Bristol, in Derbyshire, Nottinghamshire, Yorkshire, and Durham; it has been found in Scotland, in Ireland, and in the Vosges mountains, Canada, etc. Locally, it has been used with success for building purposes, and many of the varieties yield a tolerably rapidly setting hydraulic lime; but the result of the use of the Derbyshire dolomite in the new Houses of Parliament proves that considerable care is required before it is adopted for general use in London. Whether the presence of extraordinary quantities of carbonic acid gas in the rain water falling upon buildings in the metropolis, or whether the greater moisture of the air by the side of the Thames be the cause of the decomposition, it is certain that much of this stone used in that building has suffered so severely as to render necessary the application of some process for arresting its decay. In fact, although unquestionably the warm rich tone of the dolomite renders it preferable artistically to the cold grey Portland stone, experience proves that the latter is better adapted to resist the effects of the London atmosphere, especially near the river. At all times the double compounds are more soluble than the simple ones; and the dolomite is certainly more easily broken up than the ordinary carbonates of lime, especially when these latter occur in a semicrystalline state, as in the best varieties of the Portland stone.

When the dolomite contains a certain proportion of clay, in combination with the lime and magnesia, it yields on calcination a lime which may become eminently hydraulic. Thus at the Exposition of Paris in 1855, samples of the dolomite of Robache in the Vosges, and of the lime it yielded, were exhibited; as also were some samples of the dolomites and limes of



Upper Canada. In the work by DELESSE, *Sur les Matériaux de Construction de l'Exposition Universelle de 1855*, 8vo., Paris, 1856, the analysis of the materials enumerated below was given; but really the differences in the proportions of clay present are so great, and so little attention seems to have been paid to the state in which the silica of the clay exists, as to render the recorded observations of little practical value.

Dolomite of Robache.			
Dolomite.		Lime.	
Lime -	29.38	Lime -	54.21
Magnesia -	21.55	Magnesia -	39.76
Carbonic acid -	45.80	Clay -	6.00
Clay -	3.25		
Dolomite of Paris, Upper Canada.			
Carbonate of lime -	51.33	Lime -	53.82
" magnesia -	40.91	Magnesia -	35.93
Clayey residue -	5.50	Clayey residue -	10.25
Water -	2.26		
Dolomite of Oneida, Upper Canada.			
Carbonate of lime -	39.91	Lime -	36.93
" magnesia -	34.15	Magnesia -	26.71
Silica and clayey residue -	15.85	Clayey residue -	36.33
Alumina & trace oxide iron -	6.25		
Water -	3.84		

G. R. B.

DOMA (Gr. *δόμα, δόμα*) and DOME (Gr. *δομή*), see DOMUS.

DOMBE. A soft, coarse, open-grained, light wood of Ceylon, bearing a strong resemblance to inferior Honduras mahogany, taking a good polish, and presenting a pretty curled pattern: but it is not supposed to be very durable. 71.

DOMBEYA MELANOXYLON produces S. Helena ebony, which weighs 71 lbs. per cubic foot. 71.

DOME (in Oriental languages *kubba*, an arch, a vault, a dome or cupola, whence the English word alcove; *gumbaz*, the same meanings, and also that of a tower; *tak*, also used for cupola, but is rather an arch, vault, or vaulted building; *kalsi*, also sometimes taken for cupola, but is properly the pinnacle or spirelet which decorates the top of the dome: It. *cupola*, dim. *cupolino*; see the terms *tiburio* and *tugurio* noticed s. v. DOICEBUONO: Sp. *cupula* internally, *media-naranja* externally, *cupulino* being the lantern over it, and *cimborio* the pinnacle or spirelet placed above all: Fr. *coupole* internally, *dôme* externally, according to the best French lexicographers: Ger. *kugelgewölbe* or *kuppel* internally, *helmdach* externally). This term and the Ger. *dom* are derived from *δομος*, through the Latin *domus*, like the It. *duomo*, which means the house, whether domus Dei or domus episcopi. Authors have so constantly written dome for cupola that, in England and in France, the former word is scientifically as well as popularly accepted as a term for any variety of roof that is circular or polygonal on its plan and section; indeed DALLAWAY, *Anecdotes*, 8vo., London, 1800, p. 5, says "the term dome is improperly used for cupola, it applies merely to a cathedral church, and is not synonymous with a hemispherical roof, as at the Pantheon, unless the whole be elevated, as at S. Peter's"; and FERGUSSON, *Handbook*, 8vo., London, 1855, not only gives, like almost every other English writer, the name of dome to a vault having a polygonal plan, as at Sta. Maria del Fiore in Florence, and to the solid upper portion of the Indian dagobas and topes, but applies it to a roof square or octagonal in plan, of any shape externally, and formed internally by overlapping stones either into caissons, as in the porch of Vimala Sah's temple on Mount Abou, or into a pseudo-vault, as in the tomb at Mylassa near Halicarnassus. If dome be considered the same as CUPOLA, it may be described as a concave ceiling, having a semicircular or any other curve in every section,—as the external appearance of a vault forming such a ceiling or roof,—and as a roof itself of corresponding shape with, or without, such a ceiling under it. Such a dome may consist of several portions; above all may tower the 'cupola' as it is sometimes called in England (It. *cupolino*; Sp. *cimborio*), standing upon a LANTERN (It. *pergama*; Sp. *cupulino, lanterna, linterna*), which itself is constructed on the margin of the EYE or central opening of the actual dome. The main

structure sometimes has RIBS, at others it seems to spring from STEPS either forming an ATTIC, or crowning one; and windows which are not unusual in the actual dome have been called PORTHOLES ever since the time of Wren. The CURBS of a dome are courses of chained brickwork or masonry, or of connected ironwork, or of framed timber, as the case may be, immediately under the dome itself, and also immediately under the drum, if there be one; as well as to the eye, and to the base and top of the lantern. COUPLED. 1. 2. 4. 14. 19.

In accordance with the views hitherto held upon the subject, a dome must be defined as being properly a spherical or spheroidal vault, that generally rests upon a circular wall, which if raised upon another construction is called the DRUM (Fr. *tambour*); but a dome as well as its drum may stand over a polygonal or a rectangular area, in which case the base of the drum or of the dome is connected with the lines of the main wall by corbelling or by PENDENTIVES. On plan domes are sometimes circular as at S. Peter's, sometimes polygonal as at Sta. Maria del Fiore, sometimes oval as at the cathedral in Pisa. A dome is sometimes constructed as a single vault of equal thickness throughout the whole section, but more frequently thicker at the base: and sometimes (where a weight, as a lantern, is to be carried) with ribs having the surfaces between them merely filled in; sometimes there are two thicknesses of this filling, as at St. Peter's and at Sta. Maria. Like any other construction of genuine architecture a dome ought to stand by itself, i.e. the materials ought to keep their place by their own gravity and without the extraneous assistance of cement or chains. With reference to counterforts, lateral thrust, proportion of the thickness of the crown to that of the springing courses, and proportion of the voussours generally to the span, the principles which apply to the construction of arches apply equally, to a great extent, to that of a dome: the eye of the dome answering to the key of the arch. The weight, as a lantern, that may be placed on the eye of a dome, depends wholly upon the section; the strongest section being that which most nearly approaches that of a cone: in other words that section in which the line of direct pressure lies wholly within the depth of the voussours: the cone supporting the lantern at S. Paul's cathedral, London, exhibits this principle carried to its full extent; the domes of S. Peter's and of Sta. Maria exemplify a modification of the same principle: but no strength of section can compensate for deficiency of mass and strength in the counterforts which must be carefully considered. H. B. O.

The theory usually given that polygonal domes are composed of arches meeting in a centre (the circular domes being treated as polygons of an infinitesimal number of sides) is very unsatisfactory. No arch of such a section would stand without some counterpoise in the haunches. The reason that the sides of domes do not spring out is, each gore is held in by the others: hence the rings of iron chains which are intended to tie the whole together. Were each gore or arch independent of the others they would fly out with the weight of the lantern. The annularity of construction is to be taken into consideration as well as the arcuarity; and this again depends on cohesion, which it is almost impossible to calculate. An egg will bear many pounds; but a dome of dry voussours might be expected to fly out with its own weight. A. A.

It must be confessed that the want of positive information as to the principles upon which a dome, whatever be its materials, should be constructed, is not creditable to the present state of science: the unsatisfactory condition of the questions involved may be gathered from ELMES, *Lectures*, 8vo., London, 1823, who says, p. 265, that "for want of sufficient knowledge Gibbs was obliged to abandon the stone cupola which he had begun to construct over the building erected for the Radcliffe library at Oxford, and which caused dreadful fractures in the substructure, threatening final ruin, although encircled with buttresses almost colossal"; and adds, p. 268, "does the cupola of the Pantheon at Rome contain within its masonry any artificial

links or ties of iron? If not, is that of S. Peter's, in the same city, erroneous in its construction from standing in need of their later insertion? or were those fractures occasioned by cutting away and weakening the substructure by an equally lamentable want of knowledge? Are the chains which are inserted in the cone and inner dome of S. Paul's, London, essentially necessary to its present stability, or are they only wise preventives in the too certain event of decay, or the decomposition of the materials of the edifice? These are important questions, and so essentially necessary are they to the perfection of architectural knowledge, that correct answers to them would be a public benefit, and deserve the thanks of the whole world."

At the Royal Institute of British Architects, 11 December 1854, it was stated with some confidence that the present theory of arches was so far from being practical that it took no cognizance of the question of cohesion in the materials; that the writers on arches (vaulting?) had considered the dome as a case of vaulting on principles deduced from experiments on arches; and that a dome, such as that of the Pantheon at Rome, was not governed by the same laws as vaults (arches?), allowing certain exceptions, which were not specified. The inferences from these propositions will be found at the end of the paper cited. On that occasion the reasoning on the special quality of a dome was illustrated by the following diagrams, showing that in domes of equal thickness each foot has to support a less weight than itself in the next foot of height; and that the effect of leverage is nullified to a considerable extent, if not entirely, by the circular plan; whereas such a barrel-vault of the same section requires not only additions to nullify the effect of leverage, but has an effective thrust running through every voussoir, according to its position. In a dome like that above shewn, supposed to be of equal (say 10 ft.) thickness, to be 100 ft. in diameter, and to be constructed with materials weighing like brick or stone about 150 lbs. per cubic foot, the weight of each portion of one gore was attempted to be roughly shewn; thus taking  $d$  as the average of  $ab$ , then the height  $de$ , multiplied by an average between  $dv$  and  $lv$ , gives an area to be multiplied by 1500 = 420,750 lbs.; in like manner

$ef = 382,500$ ;  $fg = 306,000$ ;  $gh = 191,250$ ; and  $hk = 63,750$  lbs. nearly. It will be evident that  $ab$  would carry with the portion  $xyz$  fully half the weight of the second part of the gore; and even if the vault were merely barrel shaped would carry  $yz$ , the remaining half. The above weights, multiplied by twenty (the number of gores) give the total weights of the rings, so that the first ring, 8,415,000 lbs., being combined with the second, 7,650,000, has 16,065,000 lbs. to balance any leverage or thrust of the remainder; and the entire weight of the dome being about 27,285,000 lbs., the two lower rings are equal in absolute weight to  $\frac{1}{4}$  of the entire mass. These diagrams and calculations with considerable portions of the reasoning and inferences, were subsequently adopted by FERGUSSON, p. 442. The previous investigations of RONDELET, *Art de Bâtir*, 4to., Paris, 1835, incorporated by GWILT, *Encyc.*, 8vo., London, 1842, § 1478-93, p. 422, should be consulted.

J. W. F.

It has been stated by a resident in India that Mr. Butler, who was an officer in the East India Company's artillery, was consulted about many tombs in which the walls, being too slight to support the dome, had given way, but in which no damage had occurred to the domes; that he caused three or four iron braces to be inserted at right angles to each wall below the level of the bottom of the dome, which were

contracted by cooling after being heated to a red heat by the flame of lamps; that one building at Teheran and three others in Persia were so treated by him; and that several of his drawings were in possession of the Company.

W. H.

The following description of the construction of the Turkish domes, appears to be nearly identical with that of a system recommended, if not reinvented, for "all spherical domes, be they of little or large dimensions", by LANGLEY, *London Prices*, etc., 8vo., London, 2nd ed., 1750, p. 260, the rod being called by him a 'director'. "In some parts of Asia, I have seen cupolas of a considerable size, built without any kind of timber support. They fix firmly in the middle a post about the height of the perpendicular wall, more or less, as the cupola is to be a larger or smaller portion of a sphere; to the top of this is fastened a strong pole, so as to move in all directions, and the end of it describes the inner part of the cupola; lower down is fixed to the post another pole, which reaches to the top of the outer part of the perpendicular wall, and describes the outside of the cupola, giving the difference of thickness of the masonry at top and bottom, and every intermediate part, with the greatest possible exactness. Where they build their cupolas with bricks, and instead of lime use gypsum, finishing one layer all round before they begin another, only scaffolding for the workmen is required to close the cupola at top." ETON, *Survey of the Turkish Empire*, 8vo., London, 1799, p. 229. A note somewhat to the same effect is in COSTE, *Arch. Arabe*, fol., Paris, 1839, p. 35.

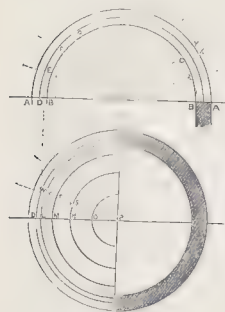
The history of domes and of some pseudo-domes was concisely treated by LEWIS, *Some Remarks*, read at the Institute of British Architects, 1 June 1857, in which variations of plan and section from the spherical form are specially noticed; and which is to be followed by some remarks on their construction. Many of the examples adduced are illustrated in ISABELLE, *Les Edifices Circulaires*, etc., fol., Paris, 1843. WARE, *Observations on Vaults*, etc. (1812), given in the *ARCHÆOLOGIA*, xvii, 40-84. GAUTHY, *Dissertation sur les dégradations survenues aux piliers du dôme du Panthéon*, etc., 4to., Paris, 1798, is also of value; as well as FERGUSSON, *Handbook*, before mentioned.

The construction of domes with JARS and POTS may be studied in SEROUX D'AGINCOURT, and in ISABELLE: a dome of mere concrete is noticed in the paper by FERGUSSON, *The Architectural Splendour of the City of Bejapore*, read at the before named Institute 27 November 1854: those of timber construction, like the upper one at S. Paul's, are given in most of the great works mentioned s. v. CARPENTRY: and those of iron, which material threatens the total disuse of others for the purpose on a large scale; these, however, are properly domical roofs and not domes.

The following list chiefly comprises existing examples of circular vaults, pseudo-vaults, and domical roofs; with their approximate diameter, probable date of erection, and reference to authorities.

ITALY.

		Diam in ft. & in. and c.	
Rome.	B.C. 18	Baths of Agrippa now the Pantheon (brick)	142'6 I. and r.
	TO A.D. 300		
"	A.D. 212	Baths of Caracalla	91 q.
"	"	Diocletian	112 w.
"	"	"	79 q.
"	o. 302	"	65'6 q.
"	300	Temple of Minerva Medica (brick, etc.)	51'6 I.
"	"	Vesta (not existing)	28'0 I. and r.
"	334	Baptistry of Sta. Costanza (brick, etc.)	37'8 I.
"	c. 320	Constantine (not existing)	28'10 I.
"	2...	Torre dei Schiavi, Via Prænestina (rufo)	45'2 I.
"	3...	Church or tomb of Sta. Costanza (brick)	37'6 I.
"	1502	Temple at S. Pietro in Montorio (brick)	40'4 q.
"	1585-90	(dome). S. Pietro	15 I.
"	"	S. Stefano Rotundo	139 w.
"	1507	Sta. Maria di Loreto	54 R.
"	1660	Sta. Agnese in Piazza Navona	58 R.
"	1575-8	Chiesa del Gesu	56 R.
"	1650	S. Andrea Apostolo da Ponte Molle, elliptic in plan	75 long 63 short R.





				Diam. in ft. & ins. inside.	
ROME.	1607	S. Andrea della Valle	-	60	R
"	1635	Sta. Maria in Campitelli	-	58	R.
"	17...	S. Ivone	-	62	R.
"	17...	S. Carlo Borromeo	-	54	R.
"	1668	S. Martino and S. Luca	-	45	R.
"	1599	Sta. Maria in Vallicella	-	45	R.
"	16th cent.	S. Giovanni Battista; 1614 SS. Trinità dei Pellegrini	-	-	-
1678 S. Andrea al Quirinale; 1660 S. Carlo alle Quattro Fontane, elliptic on plan; 1635 Sta. Maria dei Miracoli, and Sta. Maria di Monte Santo. 1664 S. Carlo al Corso.					
VERONA.	16...	Capella Pellegrini in S. Bernardino	-	33-6	I.
"	(near) 16...	Sta. Maria di Campagna (brick)	-	57-7	I.
VICENZA.	1570	Villa Capri (brick)	-	34-9	-
"	"	Church of Ara Coeli; Sta. Maria on Monte Berico.	-	-	-
NAPLES.	"	S. Francesco di Paula	-	137	-
SPALATRO.	284	Temple	-	28	T. H. L.
RIELLO.	"	Etruscan, like treasury of Atreus	-	94	CANINA.
GENOA.	"	Church of the Assumption	-	44	Q.
PIACENZA.	1564	S. Agostino	-	32	Q.
FLORENCE.	1436	Sta. Maria del Fiore (angular on plan, pointed)	-	139 { 134-6	W. I.
"	1636	Chapel of the Medici	-	94	Q.
"	550 to 725	Baptistry (pointed, brick and stone)	-	83-8	I.
"	1440	S. Maria degli Angeli; 1440 S. Spirito; 1440 S. Lorenzo.	-	-	-
MANOVA.	1732	S. Andrea	-	-	-
VENICE.	1640	Sta. Maria della Salute	-	70	W.
"	976-1043	S. Marco, the large one	-	45	Q.
"	"	Ditto, the four others	-	36	Q.
"	872-1075	Sta. Fosca	-	30	Q.
"	1578-80	Il Redentore	-	50	G.
"	1350	Sta. Maria del Orto	-	-	-
"	1566	S. Giorgio Maggiore	-	42	Q.
RAVENNA.	550	S. Vitale (pots)	-	50-10	I.
"	530	Sta. Maria in Rotondo	-	36	W.
"	490	Tomb of Theodoric (one block)	-	35 { 30-2	T. H. L. I.
"	4...	Baptistry near cathedral (pots)	-	36-5	I.
TURIN.	1731	Superga	-	6...	W.
"	1664	S. Lorenzo	-	49	Q.
BERGAMO.	16...	S. Tommaso in Limine	-	15	K.
SIENA.	1250	Duomo	-	57	W.
PISA.	1152	Baptistry, inclined sides (brick)	-	59-6 I. and T.	-
"	1596	Duomo (elliptical)	-	56-9 long { 41-3 short	T.
MILAN.	1426-65	Sta. Maria delle Grazie	-	57	W.
"	1571	S. Lorenzo	-	70	T. H. L.
"	"	S. Nazario Grande	-	-	-
PARMA.	1220	Baptistry (pointed, brick and stone)	-	54	I.
TIVOLI.	B.C. 1st c.	Temple to Vesta (not existing)	-	23-6	I.
"	(near) 5...	Tomb of the family Tossia (brick, etc.)	-	40-10	I.
POMPEII.	B.C. 1st c.	Baths (inclined sides, brick, etc.)	-	19	I.
BALE.	B.C. ...	Temple to Venus Genetrix	-	60	A. P. S.
"	B.C.	" Mercury or Hercules	-	66-8	A. P. S.
"	B.C.	" Diana	-	96-0	A. P. S.
NAPLES.	1817-24	Sta. Francesca	-	124	-
"	1752	Caserta	-	-	-
"	1592	S. Filippo di Neri	-	39-6	Q.
NOCERA.	300 or 430	Baptistry (brick, etc.)	-	39	I.
ANCONA.	10...-12...	S. Ciriaco (octangular ribbed); 1349 La Vergine della Misericordia.	-	-	-
PALERMO.	bef. 1132	S. Giovanni	-	17 springing { 18 widest	G.
"	1132	Capella Palatina	-	17-4	G.
"	"	S. Giuseppe	-	11	Q.
"	"	S. Michele	-	36	Q.
"	"	S. Simone	-	-	-
POSSANO.	1819-30	Church built by Canova	-	91	-
BOLOGNA.	12...	S. Stefano (brick)	-	36	I.
SARDINIA.	"	The Nuraghe	-	-	PETRIE.

FRANCE.

PARIS.	1704	Hôtel des Invalides (inner of stone)	-	91-10	I.
"	1790	{ S. Geneviève (now the Pantheon, inner of stone)	-	69	I.
"	1600	Val de Grace (inner)	-	55	W.
"	1653	Sorbonne	-	40	W.
"	1762	Halle au Blé (iron)	-	131	I.
"	"	Observatoire (iron)	-	-	-
"	1770	S. Sulpice	-	-	-
ROUEN.	18...	Hall of the Custom House (iron)	-	29-6	I.
LOCHES.	1180	"	-	-	-
BLOIS.	10...-12...	S. Nicolas	-	-	-
PERIGUEUX.	10...	S. Front	-	32-6	G.

				Diam. in ft. & ins. inside.	
ANGOLEME.	1120	S. Pierre; 1628? The three domes	-	30	A. P. S.
UZERCHE.	"	"	-	-	-
NEUVY.	11...	S. Sépulcre (pointed—pots)	-	30-2	I.
RIEZ.	"	Baptistry	-	15-9	I.
AIX (Bouches de Rhone).	11...	S. Sauveur	-	18-0	I.
FONTVEAULT.	"	The four domes of church	-	30	F.
"	11...	Tour d'Evrauld (inclined sides)	-	21-4	I.
GERMANY.					
COLOGNE.	1020-1210	SS. Aposteln	-	-	-
"	1227	S. Gereon (stone and tufo)	-	60	T. H. L.
AIX-LA-CHAPELLE.	983	The cathedral (octagon)	-	47-6	T. H. L.
OTTMARSHEIM.	10...	Church (tiles)	-	-	I.
BERLIN.	1746-73	S. Hedwig	-	-	-
"	1703-81	The French church	-	55	A. P. S.
RATISBON.	1180	Baptistry	-	-	-
FRANKFURT.	"	S. Leonard	-	-	-
MAYENCE.	1196	Cathedral (octangular)	-	49	G.
GREAT BRITAIN.					
LONDON.	1615-1710	S. Paul (inner of brick)	-	108 at bottom. { 100 springing.	-
"	1672-9	S. Stephen, Walbrook (timber)	-	45-0	-
"	1847-9	Coal Exchange (iron)	-	60-0	-
"	1855-7	British Museum (iron)	-	140-0	-
"	1851-3	The Panopticon, Leicester-sq. (timber)	-	72	-
"	1851	The Globe ditto	-	60	-
"	1795	Bank of England	-	57	-
DUBLIN.	1786-96	The Four Courts, the central Hall	-	64-0	-
LONDON.	(near) 1740	Chiswick Villa; 1723 Mereworth Villa.	-	-	-
RUSSIA.					
ST. PETERSBURGH.	1815-47	S. Isaac (iron)	-	96-0	-
SPAIN.					
CORDOVA.	786-988	Mosque (largest dome)	-	16	W.
"	c. 900	The mihrab therein (monolithic)	-	15	A. P. S.
NORTH AMERICA.					
WASHINGTON.	1857	The Capitol (iron)	-	124 at base.	-
PERSIA AND INDIA.					
KASHMIR.	920	Temple of Pandrethan	-	1-7	T. H. L.
"	c. 490	Payach	-	5-9	T. H. L.
DELHI.	1206	The Pathan mosque	-	-	-
SERDISTAN.	350	"	-	45	I. H. L.
FEROUZABAD.	450	Mosque (pointed)	-	-	-
SULTANIEH.	13...	"	-	82	I.
TABRIZ.	"	Mosque (bulbous)	-	58	T. H. L.
AORA.	1628	Taje Mahal	-	70	A. P. S.
ISPAHAN.	1720	Taje Mahal	-	-	-
BEEJAPORE.	1626-60.	Gol Goomuz (elliptical in section)	-	124	A. P. S.
"	16...-85	Jumma Musjeed	-	75	A. P. S.
MOUNT ABOO.	1032-1247	Jaina Temples	-	-	-
EGYPT.					
CAIRO.	1368	Mosque of Hassan	-	63	COSTE
"	1149	" (or Tomb) Barkauk	-	48	T. H. L.
"	876	" Teyloun	-	30	T. H. L.
"	1463	" Kait bey	-	30	COSTE.
GREECE; TURKEY; ETC.					
CONSTANTINOPLE.	536-563	Agia Sofia	-	104	A. I. S.
"	1550-5	Suleimanieh	-	104	A. I. S.
"	520	Agios Sergios	-	47	I.
"	880	Agios Theotocos	-	14	G.
"	1610-14	Ahmedieh	-	50	A. P. S.
"	1745-57	Osmanieh	-	-	-
ORCHOMENOS.	"	Tomb	-	79	T. H. L.
ANT.	1010-1200	Church (inclined sides, stone)	-	55	-
DIGHOUR.	1242	Church (inclined sides)	-	-	-
MYLASSA.	B.C. 100	Tomb	-	-	-
MYCENAE.	B.C. 1150	Treasury of Atreus (approaching stones)	-	18 { 46-10	STUART. I.
ATHENS.	"	Tower of Andronicus Cyrrhestes	-	23 { 21-6	STUART. G.
"	B.C. 335	Choragic Monument	-	5-6	STUART. G.
"	"	The churches of the Byzantine period are of small size, the largest dome being -	-	20	COCCHIAUD.
SALONICA.	"	S. George	-	50	F.
"	"	Agia Sofia	-	33	F.
References. I. ISABELLE, <i>Les Edifices Circulaires</i> , etc.; Q. QUATREMERRE DE QUINCY, <i>Diet.</i> ; W. WARE, in <i>Archæologia</i> , 1812, xvii, 59; T. TAYLOR and CRESY, <i>Rome</i> ; G. GAILHABAUD, <i>Monuments</i> , etc.; R. BUREIS, <i>Insignum Romæ Templorum</i> ; K. GALLY KNIGHT; A. P. S. ARCH. PUB. SOC., <i>Diet.</i> ; F. FERUSSEON, <i>Handbook</i> .					

DOMENICHINO, see ZAMPIERI (DOMENICO).

DOMENICO, see DOMINGO (EL MAESTRO).

**DOMESTIC CHAPEL.** An oratory, intended for the assemblage of a household at Divine Service, in which a recognized minister should regularly officiate. As it may be either in, or near, the house, it differs from a PRIVATE CHAPEL, and from a DOMESTIC ORATORY, although it is frequently mentioned by those names: the latter being the proper term for a chamber set apart for the assemblage of the household to prayers under the guidance of the acting head of the family. It has been stated that in the Church of England, peers only can claim as of right the possession of a domestic chapel in which the liturgy would be constantly used, and in which preaching would of course be included; consequently, where the proprietor is of less rank, it would be desirable, before undertaking the erection of such a chapel, to inquire whether any, and what restrictions exist as to its employment: reference may be made to PHILLIMORE'S edition of BURN, *Ecclesiastical Law*, 8vo., London, 1842, and later works. In England such a structure or part of a structure may also come at times within the provisions of the definitions given with regard to Dissenters', Donative, Roman Catholic, and other chapels. Some of the examples, hereafter mentioned, of domestic chapels or domestic oratories (it is not clear in all cases which rank should be assigned to them), must be studied in relation to the ecclesiastical arrangements under which they were used, and consequently it should be remembered that in Roman Catholic countries such a chapel (endowed beforehand if quasi-public and giving a title to orders) must be consecrated under licence in order to the celebration of the complete services of the church: for a long period it has been necessary to obtain the permission from the sovereign pontiff; but formerly leave from the bishop was sufficient. BURN says that there are in England "abundance of such licences, both before and since the Reformation, which remain in our ecclesiastical records not only for prayers and sermons, but in some instances for sacraments also." This explains the extant episcopal licences occasionally renewed in the time of Edward III to the owner of Crook Hall, Durham, to have Divine Service under certain conditions, inclusive that the family should go to the parish church on the day of dedication, and of each great festival, and should make no offerings at the altar of the domestic chapel: as appears by a note in the continuation of TURNER, *Some Account*, 8vo., Oxford, 1851-3, i, 152-4, ii, 79-88, 263, 309, and 330, whence the following notes on early domestic chapels and oratories in England are taken, with the omission of the illustrations and of the examples given by collegiate or conventual buildings. The chapel, if there was one (for the hall was sometimes used for Divine Service, and was therefore called the chapel, as at Sutton Courtenay, Berkshire, and Crook Hall), was usually next in importance to the hall, but varied in size, situation, and relative importance. It was generally connected with the hall by a short passage from the dais; but at Maxstoke Castle, Warwickshire, it is transverse to the end of the hall, and includes in its height a room below the hall, as well as the principal apartment; while at Little Wenham Hall, Suffolk, the chapel is merely a chancel separated from the hall or nave by a screen having a door and two windows, which were closed by shutters when not in use; an open screen with curtains is also mentioned. The chancel appears to have been generally of the same height as the hall, and to have been provided with altar, piscina, sedilia, and ambry. The nave sometimes had aisles, as at Haddon Hall; but it was frequently divided into two stories that were either open, or only divided by a screen from the chancel, and were furnished each with a fireplace; the domestics appear to have occupied the lower floor, as at East Hendred, Berkshire. It must be remarked that the entry in the *Liberate Roll*, 21 Henry III, intimates to some extent that each such room was called a chapel. The upper room, or gallery, seems to have been sometimes called an ORIEL. In several instances houses appear to have possessed,

ARCH. PUB. SOC.

in addition to the chapel, smaller chapels, or rather private oratories. At Lyte's Carey House, Somersetshire, the chapel is in a projecting wing of the mansion, and shows its character externally. The room over the gateway and porter's lodge of the gatehouse to a large dwelling was (as at Prudhoe Castle, Northumberland, given in TURNER, ii, 206, *temp.* Edward II, where the chancel is a bay window) sometimes used as a chapel. The provision of two small rooms for the chaplain should not be forgotten. The chapel at Ludlow Castle was a detached building. Particular views as to modern domestic chapels have been propounded in the *ECCLESIOLOGIST Journal*, 1845, iv, 145, 248; 1850, ix, 362. Twenty steps lead from a chapel in the schloss or castle at Persenburg in Austria, to two smaller ones below it.

The remarks of VIOLET LE DUC, *Dict.*, s.v. Chapelle, p. 439, tend to show that the episcopal, abbatial, and signorial chapels in France were mostly very simple, consisting of a nave and apse in general, with sometimes two transeptal recesses for the owner and his family, and sometimes also, as at Montargis, with two narrow aisles, each having an absidal end, during the Romanesque period; while some châteaux had two chapels, one in the basse-cour for the servants and garrison, the other attached to the rooms inhabited by the owner, as at Coucy. The same author observes that two-storied chapels, such as have been above described as having existed in England, were not unusual in the French châteaux, and that the domestic chapels of such dwellings were not simple oratories mixed up with the rest of the edifice, but were almost always separate buildings, either having their peculiar dependent apartments, or connected with the dwelling by a gallery, porch, or passage. The Ste. Chapelle at Paris, with its lower chapel for relics, etc., is regarded by him as the type of the signorial chapels from the middle of the thirteenth to the end (? middle) of the fifteenth century. He notices the chapel in the house of Jacques Cœur at Bourges; and intimates that afterwards, *i.e.* from about 1500, the plans of domestic chapels varied, as at Amboise, Anet, and Ecouen, like the plans of churches themselves. 19. 96.

**DOMINGO (SAN).** A city founded 1502 in the island of Hayti. A thick wall and fortifications enclose the dwellings, which are neatly and solidly built, and which preserve the arrangements introduced by the original Spanish inhabitants: each has flat roofs, an interior galleried court with a tank for rain-water, and balconies to the streets, which are straight and wide, having brick footways. The cathedral, dedicated to the saint whose name is given to the city, is said to be in a Gothic style, and to be imposing chiefly on account of its very bold cupola. The fine church that belonged to the Jesuit college; some churches and monastic establishments, handsome of their style; the town-hall; the former residence of the Spanish governors; the large arsenal; the barrack; and the hospital, are the chief public buildings. 50. 96.

**DOMINGO (EL MAESTRO)**, a Genoese, was the *maestro-mayor* engaged 1570-2 as successor to Juan Bautista Castello (el Bergamasco) in the erection of the palacio del Viso at Sta. Cruz in la Mancha, for the first marquis of Sta. Cruz. 66.

**DOMINGO DE LA CALZADA (SANTO)** appears to have been engaged in making roads and constructing causeways in the district of la Rioja in Spain, for the accommodation of the religious passengers; amongst these works was a large bridge over the river Oja. He was employed by king Alonso VI to repair and erect several hospitals for a similar purpose; and erected 1098-1105 the cathedral of Santo Domingo. In 1107 he was joined by S. Juan de Ortega, who with him built the bridge at Logroño over the Ebro, and commenced that at Najera over the Najerilla; this last work was completed by S. Juan, after the death of S. Domingo 12 May 1109. 66.

**DOMINGO DE LA CALZADA (SANTO).** A city in the province of Logroño in Spain. The walls of hewn stone 6 ft. thick and 20 ft. high, with seven gates, enclose houses chiefly of one story in height, presenting good fronts to the streets,



which were all paved in 1839. The plaza del Mercado, or de la Constitucion, occupies part of the site of the episcopal palace, destroyed 1812, the rest being planted; on its north side are the casas consistoriales, and on the east are the tribunal and prison. The plaza Nueva, or de la Verdura, has three sides with porticoes, and contains the casa Ciriucla. The plazuela de las Monjas is formed on two sides by the Bernardine convent. The plaza del Santo is in front of the cathedral, this city being the seat of a diocese removed from Nagera, to which that of Calahorra was united 1227-35. The church itself is under the invocation of the Saviour, the Assumption, and S. Domingo; the original building, commenced by S. Domingo 1098 and finished 1105; enlarged 1168-80 or rather later; contains his mausoleum, 1440; the monument of king Henry II of Castile, 1379; many other tombs dating 1418-1522; the chapel of S. Mary Magdalen, 1539; two sacristies; some of the chapels and half of the stall-work of the choir date 1517, when the cloister, finished 1559, was commenced; the rest of the stall-work has been replaced since the fire 24 December 1825. The campanile, 30 ft. square and 248 ft. (Spanish) high, the middle portion being octagonal, is separated from the church by the calle mayor, and was built 1762-7. The magnificent Franciscan monastery, rebuilt 1571 from a design by Juan de Herrera, is occupied by the casa de Caridad or de Misericordia, its two schools, and an hospital; this building, especially the portion last named, appears to deserve study: its noble church is now a chapel of ease. The city is surrounded by boulevards planted with trees, outside of which is the campo-santo, with its chapel divided into an oratory and a dead-house, erected under the general order made 1806 for the establishment of cemeteries. 85.

DOMINGUES (AFFONSO), born at Lisbon, was probably the first architect engaged upon the buildings of the monastery commenced at Batalha about 1386. RACZYNSKI, *Dict.*, 8vo., Paris, 1846, s. v., and *Lettres*, 8vo., Paris, 1836, p. 225, supposes that he died before 1402, according to a document of the year.

DOMINGUES (DOMINGOS) was the architect under whom the first stone of the (claustrum) monastery at Alcobaça was laid 13 April 1310. 88.

DOMINICAN or BLACK FRIARS, or PREACHING FRIARS, called in France JACOBINS, from having their first house in that country in the rue S. Jacques at Paris, appear to have existed before 1204, but their rule, which was chiefly that of S. Augustine, was not approved by papal bull until 1216. The Benedictine institution having departed at the commencement of the thirteenth century from the activity of its mission, the establishment of the Dominicans (1209), and of the Franciscans or Minorite Friars (both being called Mendicant Friars), was a sort of reaction against the quasi-feudal constitution of the Benedictines: and S. Louis was not disinclined to give the new Orders a preponderance in France over the too independent establishments of Cluny and Cîteaux, as has been remarked by VIOLET LE DUC, *Dict.*, s. v. Architecture, p. 297. With regard to the statement made by BOURASSÉ, *Archéologie Chrétienne*, 8vo., Paris, 1840, App., that the church of SS. Giovanni and Paolo (at Venice), commenced 1246 and not finished 1390, was constructed by the Dominicans, whose architects followed one style, while the Franciscans adopted another, MARCHESE, *Lives*, etc., 8vo., Dublin, 1852, i, 73, observes that "it would be desirable to learn where the author came by such information, and what constituted the styles followed by the Dominicans and the Franciscans." But on the same page this writer, adopting the observation that, "as the Dominicans commonly had architects in their communities, it is likely they would have had recourse to some member of their brotherhood", adds that "the Franciscan order, neither in the thirteenth nor fourteenth century, as far as I can learn, employed any architect of their own body to erect any edifice of importance"; and PUGIN, *Treatise on Chancel Screens*, 4to., London, 1851, p. 123, remarks that "the

Dominicans were great preachers, and consequently their churches are like immense naves, with lateral chapels between the buttresses; the high altars placed against a reredos, behind which was the choir for the religious." VALÉRY, *Voy. Hist. et Litt.*, 8vo., Paris, 1838, xii, 8, expresses astonishment at the peculiar character of the Gothic architecture of the period, which he pronounces noble, simple, and majestic. A similar opinion is recorded by MONTALEMBERT, *Du Vandalisme*, etc., 8vo., Paris, 1839, p. 7, saying "une sorte de fatalité toute particulière semble s'attacher aux églises construites par les Dominicains, toujours d'un goût si simple, si pur, si régulier: elles sont partout choisies en premier lieu par les destructeurs."

The Dominicans "devoted themselves heart and soul to civil and religious architecture. And, indeed, if any one should ever undertake to write the history of this most noble art, he must necessarily throw much light on what the Dominicans have done for its advancement in a cycle of four hundred years. In Rome, Florence, Pisa and Venice, they formed a community of architects, engineers, and masons; and they practised these various branches for the benefit of the different states—nay, and of the private citizens, with a zeal and intelligence of which monastic history furnishes no parallel.—Meanwhile, the study of VITRUVIUS and ALBERTI, had evoked the classic eurythmy of the Greeks and Romans, to a new life, and the Preaching Friars were amongst the earliest promoters of this style of architecture, as they were of that which has been designated Teutonic and Lombard. Colonna, Giocondo and Danti are quite sufficient to establish the artistic glory of the Order, in all that relates to this first-born of the Arts"; MARCHESE, ii, 331-3.

VIOLET LE DUC also observes, p. 298, that "as the Mendicant orders arrived late in the world, and as the nature of their mission must have obliged them to be near the great centres of population, they did not find, as their predecessors had found, large sites that would allow them to spread out and arrange the buildings of their monasteries according to any uniform system." Unfortunately, when this able writer says, p. 306, that "from the end of the twelfth century, except some traditional arrangements preserved in the monasteries, some particular plans brought in by the new Preaching orders, monastic architecture did not differ from civil architecture", he omits to state what those particular plans were; and there hardly remains anything to fill up the vacancy except to notice the pulpit at the west end in the south aisle or nave at Toulouse; and the school at Paris; except where, p. 298, he expressly says of the church of the Jacobins in the rue S. Jacques at Paris, that "it presented a plan unused until that time; viz. two aisles (or rather one nave), divided by a range of columns; this arrangement appearing perhaps favourable for sermons, for the stalls of the religious being placed in one of the aisles, the other was left clear for the faithful, who could thus see and hear easily the preacher occupying a pulpit at one of the extremities." Plans are given by him of this church, and of that of the Jacobins at Toulouse (also with a divided nave), *Illustrations*, CHURCH-PLAN, 1856-7; as well as a notice that the church of the Jacobins at Agen was similar in plan; these belong respectively to the commencement, the end, and the middle of the thirteenth century.

Among the fine Italian Dominican churches, are SS. Giovanni e Paolo at Venice, commenced 1246; of S. Nicolò at Trevigi, 1310-15, completed 1352; of S. Agostino at Padua, 1226-1303, destroyed 1822; Sta. Maria Novella at Florence, 1278-1420; Sta. Maria sopra Minerva at Rome, 1274-80, these two last were probably by the same architect; and S. Domenico Maggiore at Naples. DUGDALE, *Monasticon*, vi, 1482-1500, gives notices of fifty-eight houses of Black Friars formerly existing in England and Wales, amongst which there are remains still existing at Hereford, with a cross; Gloucester, the church modernized; Norwich, the church divided into the S. John Baptist or Dutch church (the workhouse chapel), and S. Andrew's hall (the

guildhall and corn market); Ipswich, the cloisters and refectory; and perhaps at Brecknock, a chancel.

With regard to similar edifices in Ireland, BRASH, *Franciscan Friary at Adare*, given in *Transactions of the Kilkenny, etc., Archaeological Society* 1856, stating that the chancel is the same in breadth as the nave, the length being very nearly two-thirds that of the nave, adds that "this proportion is very nearly observed in most of the religious houses of the period (fifteenth century), and principally of the Franciscans and Dominicans." At Buttevant the nave is 73 ft., the chancel 56 ft.; at Kilmallock the former is 85 ft. and the latter 67 ft.; the chancel arch being of exceedingly small dimensions; while the chancel of the churches of the Cistercian order are greatly less in length, and the chancel arch of ample width and lofty proportions. Albertus Magnus (1193-1280) is said to have designed the Dominican choir of the church at Freiburg, and of that of Cologne.

DOMINICIS (CARLO DE) restored the church of S. Salvatore delle Coppelle, and designed 1730-40 that of SS. Celso e Giuliano, both at Rome. 12.

DOMINICUM. A late Latin word for a church, according to BINGHAM, *Origines*, 8vo., London, 1840, ii, 337-8, 369.

DOMINUS was the architect engaged by the emperor Justin upon the repairs, etc., of the Prætorium in the sixth region at Constantinople, according to GYLLIUS, *Constantinople*, 8vo., London, 1729, p. 170, who quotes one (which does not verify the assertion) of the two epigrams that mention this name by Paulus Silentiarius in the *Anthologia*.

DOMUS (Gr. δῶμος). This term, the foundation of opisthodomos, prodomos, etc., has been already mentioned as the origin of the It. *duomo* and the Eng. *dome*, through the Lat. *domus*, which with itself is derived from δέω, I build: that word is equally the root of δῶμα, δῶμα, and δομή, all having the same foundation of signification, i.e. the arrangement of materials to afford security. The two latter words, from which isodomos, etc., have been made, appear to have rarely meant in architecture anything more than a construction such as a wall. The difference between δῶμα and δῶμα is considerable: the first is rarely met with; the other is constantly used in the plural, δωμάτα, for the whole of a dwelling, throughout the *Odyssey* as well as the *Iliad*, where, vi, 313-16, the harem or THALAMOS, δῶμα, evidently the body of the house, and AULÆ are specified as composing the domata of a prince: INWOOD, *Erechthion*, fol., London, 1827, pp. 55-6, 63-4. With reference to the phrase ἐν τῶν δωμάτων in S. MATTHEW, x, 27, upon which there has been much controversy, it may be sufficient to notice that S. JEROME, *Ep. ad Summian et Fretelem*, cvi, 63, says that "δῶμα in orientalibus provinciis idipsum dicitur, quod apud nos tectum: in Palestina enim, et Ægypto, . . . non habent in tectis culmina, sed domata, quæ Romæ vel solaria, vel meniana vocant; id est, plana tecta, quæ transversis trabibus sustentantur"; and in Romaic δῶμα does appear to mean a terrace. The word δῶμος has a wide range of meaning; the ordinary explanations are, habitation, story, room, stall, fold, cell of an insect, and even a course of bricks or stones; while STEPHANUS, *Thes.* s. v. gives several technical Latin names of apartments as representing its meaning in passages from various Greek authors. *Domus* appears to have been reserved by the Latin writers of the best ages for a house or dwelling; and to have served as a diminutive of ἄδεις, which signifies a temple, a house in a town, or some other important edifice. By late writers, 'domus' with some epithet, was however applied to a church, according to BINGHAM, *Origines*, 8vo., London, 1840, ii, who instances the cases, p. 339, 367-9, of 'domus columbæ', and 337, of 'domus Dei', and 357, of 'domus synaxæ'; but 340-1, notes that 'domus ecclesiæ' seems to have been employed sometimes for a church, sometimes for the episcopal residence; in which last sense he accepts, 342, of 'domus sacerdotalis': the same writer very justly guards, p. 340, against the error of supposing that 'domus divina' ever

ARCH. PUB. SOC.

meant anything but the imperial family or its palace. What the 'domus basilica', mentioned by him, p. 481, as the house of the clergy, might really be, is not very clear; *basilica* here might be simply an epithet expressing the importance of the building. The 'Domus Inclusa', or *Habitable Chamber found in many of our ancient Churches*, is the title of a paper read before the Lincoln Diocesan Architectural Society, June 2nd, 1853, by M. H. Bloxam, and given in *UNITED SOCIETIES' Reports*, etc., ii, 349-361. ANCHORAGE.

DONATI or DONATO (LORENZO) is mentioned by FRANCHETTI, *Storia del Duomo*, fol., Milan, 1821, as one of the architects consulted from 10 January 1395 until 14 September 1399 on the works for the cathedral at Milan, in the celebrated criticism of the works by Mignot recorded in GIULINI, *Memorie*, 4to., Milan, 1760, xi, 454-8.

DONATIVE. A spiritual preferment, whether church, chapel, or vicarage, which is simply conferred by the written donation of the patron, without presentation to the bishop, and without admission, institution, or induction by any mandate from the bishop or other. This right of the donor, together with the exemption of the church from ecclesiastical jurisdiction (which points may be important in cases of repairs or rebuilding), perhaps sprung from the consent of the bishop in some particular cases: as when the lord of the manor in a great parish, having his tenants about him at a remote distance from the parish church, did offer to build and endow a church there, provided that it should belong to him and his family, to put in such persons as they should think fit, if they were in holy orders. It is very probable that the bishop at that time, to encourage such a work, might permit them to enjoy this liberty; which being continued time out of mind, is turned into a prescription. The differences between a donative and other churches or chapels is further explained by PHILLIMORE in BURN, *Ecclesiastical Law*, 8vo., London, 1842, s. v. Chester-le-Street, Durham, is a curacy donative with a church formerly collegiate.

DONATUS built for Canute IV, c. 1080, or V, c. 1190, the cathedral at Lund. An architect of this name also practised in Denmark in the twelfth century. 68.

DONCASTER STONE. The most remarkable quarries in the district of Doncaster in Yorkshire, are the following: the freestone of Roche Abbey, peculiar for its beautiful whiteness; that of Mexbrough, called gritstone, chiefly used for the curbs of pavements; the limestone of Sprotborough, formerly used in a very large number of the houses at Doncaster, in consequence of the great price of bricks; and Brodsworth, which has three quarries of freestone, but not of equal quality; one of them was fixed upon by the workmen employed by Lord Yarborough to examine a number of quarries in Yorkshire, as being of the best quality to build his mausoleum at Brocklesby in Lincolnshire, which is said to have cost £30,000: MILLER, *Hist. of Doncaster*, 4to., Doncaster, cir. 1804, p. 9. CADEBY STONE; CROOKHILL STONE.

DONJON, see DUNGEON.

DONNAT (JACQUES), born 1741, was pupil, son-in-law, and partner of Giral, with whom he designed the *place Peyrou* at Toulouse. He afterwards acquired employment in the Vivarais, and there built many public and private edifices, directed the restoration of the archiepiscopal palace at Narbonne, and the erection of the cathedral at Alais; besides laying out the streets by which the latter structure is approached. He also designed the catafalque in Notre Dame at Paris for Louis XV; and the fêtes at Certe on the progress of the counts (formerly kings) of Provence. He died July 1824 at Montpellier, according to p. 256 of the *Kunst-blatt*, in the *MORGEN-BLATT* of that year. 68.

DONOSO (JOSEF), son and pupil of the painter Antonio Jimenez Donoso, was born at Consuegra in Spain. Amongst his architectural works at Madrid, produced after the return from his studies at Rome, were the retablo of the church of S. Basilio, and of the church of the monastery de la Victoria; the



cloister of the college of S. Tomás; the front of the Panaderia (in the plaza Mayor) above the ground floor of the principal portion, which with the portico had been executed by Juan Gomez de Mora; the portada de los pies to the parish church of the Holy Cross, near the carcel de Corte; and the portada and church of S. Luis. He succeeded to Bartolomé Zombigo, 13 August 1685, as maestro-mayor to the cathedral at Toledo; and dying 14 September 1690, was buried in the parish church of S. Luis at Madrid. 66.

His contemporary, don JUAN ESTEBAN DONOSO, was an architect of equally meretricious taste. 68.

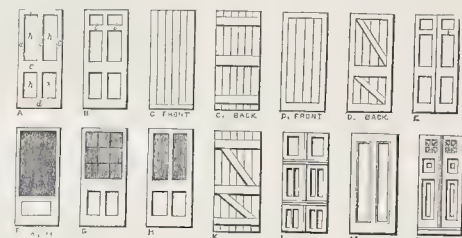
DONOWELL (JOHN), whose name as draughtsman is attached to several good engravings of buildings about 1753, designed a house at West or High Wycombe, Buckinghamshire, for Lord le Despenser, given in WOOLFE and GANDON, *Vit. Brit.*, fol., London, 1767-71, ii, pl. 47-9.

DONSELLO or DONZELLO (PIETRO and IPPOLITO DEL), half-brothers, the eldest of whom was born at Naples about 1405. They were chiefly painters, but having studied architecture under Agnolo Franco, Antonio Solario (il Zingaro), and Giuliano da Majano, they succeeded to the latter in the direction of the government and other works, inclusive of the city wall; the cathedral, and the church of S. Domenico, both having been destroyed by the earthquake 1446, were rebuilt 1450; and the palazzo di Trojano Caracciolo in the piazza de S. Giovanni a Carbonara. It is supposed that the younger artist died at Florence, and that the elder was buried in the church of Sta. Maria la Nuova at Naples about 1465, or 1470 according to the authorities cited by DOMINICI, *Vite*, 8vo., Naples, 1840, i, 312, but after 1481 as stated in the note to VASARI, *Vite*, 12mo., Florence, 1848, iv, 7.

DOOR (It. *porta*; Sp. *puerta*; Fr. *porte*; Ger. *thür*). The name which answers to the Greek *θύρα*, and the Latin *FORIS*, *JANUA*, and *VALVA*, (*FENESTRA*, *OSTIUM*, *PORTA*;) for the flap, simple or framed, solid or nearly solid, used for closing an opening. Modern doors are generally formed of deal, of wainscot, or of mahogany, sometimes of slate or of iron, and are variously made. The cheapest are of three sorts; *ledged*, so called from being made of upright boards placed edge to edge with rails termed ledges fastened at the back; *ledged and braced*, which have diagonal pieces applied as struts between the ledges, of which sort are the doors from an illuminated manuscript dating about the beginning of the fourteenth century, given in the *ARCHÆOLOGICAL Journal*, 8vo., London, 1845, i, 302-3; *framed, ledged and braced*, when the latter has the addition of a morticed and tenoned frame; *DOOR-BAR*; *double batted*, or more properly *double boarded*, when the ledging or framing is included between two thicknesses or faces of boards; *single batten*, when on either of the above, battens are laid to represent rails and stiles, which appears to be a remnant of the mediæval system of finishing doors by covering the

wainscot. His old single batten doors, however, had neither ledges nor framing, but the slips were laid on the boards when glued up; and his double batten doors were simply doors of boards with slips on both sides. The double, or batted and lined, doors of his time 'commonly used' were made of whole deal batted on the outside, with pieces 4 or 5 ins. wide mitred round the inside and the inner face brought up flush by the addition of slit deal.

The following cuts show some of the usual modern methods of framing doors.



A, Four panelled door. B, Six panelled door. C, Ledged door, showing in front at bottom a clamp-rail that is now sometimes introduced to receive the ends of boards. D, Framed, ledged, and braced door. E, Double margin door, which if in two leaves is called a folding door. F, H, Panel glazed doors. G, Casement glazed door. F and G also show a 'diminishing stile'. I, Ledged and braced door.

An ordinary panelled door is composed of stiles and rails mortised and tenoned together, so as to form a framework for the panels, which are let into grooves sunk out of the stiles and rails. The wider rails are sometimes double tenoned. The tenons were usually fastened in the mortices by pins of wood driven through the *DRAWBORE* holes; but now the framework is secured by glue, and glued wedges are driven in at the ends of the tenons. The parts of a four or six panelled door are thus named, fig. A.

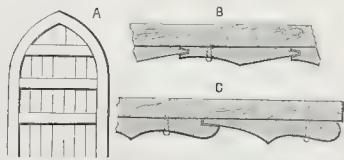
a, The hanging stile. b, The middle stile or mounting stile, abbreviated to muntin, or munting, or muntion. c, The shutting stile, falling stile, or meeting stile. d, The bottom rail. e, The middle or lock rail. f, The top rail. h h h h, The panels.

In a six panelled door the rail under the top rail caused by the insertion of an extra panel, as *i*, *i*, in figs. B and E, is called the frieze rail. The panels are called *upright* when they are taller than their width, *square* when the height and width are alike, and *lying* when they are wider than their height.

The scantlings of doors vary according to their intended use and position. The ordinary dimensions of framing similar to fig. A, which may be described as an 1½ in. on both sides four panelled square framed door, would be these: the stiles, muntin, and top rail, 4½ ins. wide; the locking rail and bottom rail, 8½ ins.; the panels ¾ in. thick. **BATTEN DOOR; COVERED DOOR.**

A. H. M.

An immoveable imitation of a door, such as those which, in the rock-cut tombs, give some of our best notions of the ancient doors, is known as a *false door*. A vertical door divided by a cut from side to side gives two *hatches*; while each piece caused by a division from top to bottom is properly a *leaf*, as in shutters, but it is frequently called a door. A small door framed in a larger one is termed a *wicket*. A *gate*, which term is improperly applied to coach-house doors, and in some other instances, is a door having the framing entirely, or almost entirely, unfilled, or else filled with open work. A *jib-door* is one contrived to appear as a portion of the wall in which the doorway is made. The technical name of *trap-door* denotes that the door belongs to a frame fixed horizontally. A *swing-door* is one which is not stopped by a rebate, so that it can be pushed open on centres either from within or from without. A *single door* is said to turn on pivots, as in the Eastern and early European examples: to hang on hinges: to roll (slide is sometimes used) on balls or wheels (a system recommended as a novelty by WARE, *Complete Body*, fol., London, 1767, p. 459; details of suspended rolling doors are given in the *BUILDER Journal*, 1850, viii, 17), or on balls laid in grooves: to rise when hung with counterbalance weights like a sash: and to slide when



A, Door with single batten. B, Door with double batten. C, Door with different batten arrangement.

joints of the boards with plain or chamfered or molded slips; *double batten*, if these rails and stiles are placed on the inside as well as on the outside; of course the boards themselves may be shot, rebated, or tongued, and be beaded or not at pleasure when they are not to be so covered. Ordinary doors without planing, whole deal and rebated doors, double doors batted and made wainscot-fashion, with single and double batten doors, are mentioned by NEVE, *Dict.*, 12mo., London, 1736, who does not notice *framed* doors in *deal*, but only in

slipping in grooves. Something like these last methods appears to have been practised in very early times; to say nothing of the slabs allowed to fall down in grooves into their places in the pyramids and in tombs in most countries (the portcullis is considered as one of the oldest means of defensive fortification), several tombs in Asia Minor, etc., had doors that were made to slide sideways in grooves, according to SMITH, *Dict. Ant.*, p. 626, who does not cite any engraved illustration. But throughout the East to a comparatively recent period, and in Europe (at least in Spain) so late as the fourteenth century, the door was made generally to turn on pivots formed by the prolongation of what is now called the hanging stile, whether the opening was closed by a single leaf or was closed by two leaves each having their own pivots and resembling what are technically called *bivalve*, but generally and most improperly *folding doors*: the only exception seems to have been in the case of four-leaved, or more properly *quadrialeve* doors, where, as each inner leaf must have hung to an outer one, hinges must have been employed. That the ancients had *double doors* appears from OVID, *Heroid.* xii, 150, "ad geminae limina prima foris"; which probably were placed, like the modern ones, in one aperture for the sake of warmth. Until the time of Hippas the Greeks made the doors of their private houses to open towards the street, while the special privilege accorded at the very same period (B.C. 509) to Publius Valerius Publicola shows that the reverse was the Roman practice: indeed in the house of the Tragic Poet at Pompeii the marble threshold rises about an inch higher than the bottom of the door.

Perhaps the three-leaved and six-panelled door painted on a wall under the eastern colonnade of the portico of Eumachia at Pompeii, has given as much ground for conjectures as any relic of ancient decorative work: it has afforded NEWTON the apparently fair ground of translating 'bifores' by *bivalve*, 'fores valvate' as three-leaved, and 'quadrifores' as four-leaved doors, in the instructions which, where they occur in VITRUVIUS, iv, 6, have been so mangled and amended that the student is referred to the text and notes, given in the work by DONALDSON (cited below), who also gives the Eumachian door and a bivalve ten-panelled door from an alto rilievo. What VITRUVIUS meant by doors that were not *bifores*, nor *valvate*, but *clathrate*, is unintelligible as regards the last word; *claustrata* has been suggested by BALDUS, and *claustrum* does seem to have been used for the leaf of a door, as in CLAUDIAN, vii, 92, and MARTIAL, *Ep.*, x, 28: yet neither *clathrate* nor *claustrata*, as equivalent to *quadrifores*, seem to convey any satisfactory account of their exact meaning, unless the idea of thin upright boards were intended; and the Latin technical name for a single-hung door is not known. The figure N is from the Casa della Camera Nera, at Pompeii, where also in a house, given in the MUSEO BORBONICO, vii, plate A B, holes were found in the marble cill for the bolts (*pessuli*) of the door, which plainly proved they were hung in four folds.

Doors have been enriched in various ways, as by the disposition of the framing, and its decoration by moldings or other ornaments; by the various shapes, sections, and enrichments of the panels; by the duplication and triplication of the outer stiles and rails; by the suppression in appearance of the middle rails; by the insertion of false parting beads with duplication and triplication of the stiles; by the duplication of the rails and triplication of the stiles; by the decoration of the stiles and rails; by veneering with ornamental woods; by the introduction of glass, metal, marble, etc.; and by decorative coloring. Most of these methods are shown in THIOLLET and ROUX, *Nouveaux Recueil de Menuiserie*, fol., Paris, 1837, who also give, as at L above, an ingenious mode of filling up a doorway which is required by the design to be larger in dimensions than necessary or convenient for the exigencies of general use; it consists in placing a transom at the head of the small door, and running similar moldings across this small door at a suitable distance from the ground; the two horizontal sets of

moldings run through a meeting pilaster, which divides the real door from a duplicate leaf, and also divides the space above the transom; thus the general design of the large door is six-panelled, of which two constitute the small door. This appears more successful than the systems indicated as adopted for the same purpose in this country, in DONALDSON, *Doorways from Modern Buildings*, 4to., London, 1836.

The materials of the Asiatic, Greek, and Roman doors appear to have been wood, as cypress, elm, fir, oak, olive, etc.; metal at an early period, especially bronze, according to PLINY, *H. N.*, xxxiv, 7, and DONALDSON, *Doorways from Ancient Buildings*, 4to., Lond., 1833, who gives the examples from the so-called temple to Remus, and from the Pantheon (with doubts as to age in the latter case) at Rome; iron, according to the last named writer, who, however, gives no authority touching this delicate point; and stone. Decoration by painting was not unknown; and from a very early period gold, sometimes perhaps silver, and frequently bronze, were used for the addition of enrichment by material, to which may be added ivory; and later (that is to say in the time of LUCAN, *Phars.*, x, 120-1) tortoiseshell. But the gold and ivory were also used in sculpture, either of the figure or of ornament (CICERO, in *Verrem*, iv, 56), and consequently simply panelled doors have alone perhaps survived to the present time, except in the instance of the enriched Etruscan stone door still to be found on the floor of the tomb called the Grotta delle Inscrizioni at Corneto, and said by DENNIS, *Cities*, etc., 8vo., London, 1848, i, 338, to be divided into small square compartments containing figures of wild beasts or monsters.

The following lists, noting books in which illustrations or other information is given, and exhibiting the chief works of this nature classed according to their material, are chiefly due to the labour of Mr. J. M. Lockyer, who has obligingly lent the use of his notes for the present occasion.

## DOORS OF STONE.

Of a known period, of course, is the single slab of marble serving for a door to a tomb, and shewn by MAZOTS, *Ruines de Pompeii*, fol., Paris, 1829, i, pl. 19, fig. 4, as 36 ins. high, 33 ins. wide, and 4½ ins. thick, turning on two such pivots as are above described, which are protected by bronze cases that work in sockets of the same material. DONALDSON, as above cited, gives the instance of an imitation of a single four-panelled door to the tomb of Theron at Agrigentum. Very much older than these is the bivalve door to the tomba delle colle Casuccini at Chiusi, consisting of two pivot-hung plain slabs of travertine stone, each 52 ins. high, 18 ins. wide, and 4 ins. thick, shewn by DENNIS, ii, 360, who mentions, pp. 339, 377-8, that other such doors had been found. For several examples of real or false four, six, and ten-panelled stone doors to the tombs at Aizani, at Pessinuntum, and at Telmissus, reference may be made to TEXIER, *Asie Mineure*, fol., Paris, 1839, pl. 37, 38, 51, iii, 169-174. At the ancient town of Kuffer, near Bostra, the doors, 'uniformly of stone, and even the gates of the town, between 9 and 10 ft. high, are of a single piece of stone', according to BURCKHARDT, *Travels in Syria*, 4to., London, 1822, p. 90.

## DOORS OF WOOD.

France. Church of La Voulte Chilhac, near Puy; rudely carved with interlacing borders and inscriptions; eleventh century: DE CAUMONT, *Abécédairé Relig.*, p. 149.  
Aix, bouches de la Rhone. S. Sauveur, doors of carved cedar or wainscot, 1503. A. P. S.  
Seez in Normandy; west door of cathedral, of Early English date, having successive tiers of small handed shafts supporting trefoil arches, which are fastened on with nails with projecting conical heads: GLOSSARY.  
Germany. Ste. Maria in Capitolio, Cologne; richly carved in panels with Scripture subjects; twelfth century: GAILHARAU, *Mon.*, ii.  
Ste. Colombe, Cologne; figures of Christ and the Virgin to a large size, one on each valve; fifteenth century: GAILHARAU, *L'Arch. du Vme*, etc.  
Remagen; SS. Peter and Paul; doors of Romanesque work: WEBB, 72.  
Italy. Sta. Sabina at Rome; panels of bas relief of Scripture subjects and borders of vine leaves; thirteenth century: D'ARNOUCOURT (Sculpture, pl. 22).  
The Greek monastery, Grotta Ferrata, near Rome; enriched with iron work; eleventh century, belonged to the original church: GAILHARAU, *Mon.*, ii.



Duomo and baptistry at Parma; panels with borders and bronze rosettes; sixteenth century.

La Martorana at Palermo; rich Saracenic ornament filling the panels; twelfth century, the church dates 1139-43: GAILHABARD, *Mon.*, iii.

Palazzo Reale at Palermo; filled with birds, animals, etc., entwined in rich foliage; cir. 1200-50, from the old palace. ARCH. PUB. SOC., *Illustrations*, 1858-9.

Capella dei Pazzi in Sta. Croce, at Florence; panelled with rich borders; fifteenth century, by Brunellesco: GRANDJEAN and FAMIN, *Arch. Toscane*.

S. Anastasia, Verona; battening forming small ornamented panels. S. Pietro Martire, Verona; battening forming trefoiled headed panels; both these doors are external: STREET, *Brick and Marble Arch.*, 8vo., London, 1855, 80, 82; ARCH. PUB. SOC., *Illustrations*, 1858-9.

Arena chapel, Padua; covered with cut iron plates.

Duomo, Ravenna, of vine wood slips 11 ft. high and 2 ins. wide.

KIRTON, *Illustrations*, fol., Calcutta, 1838-40, has not given the date of his specimen, pl. 1, of a bivalve battened door with its six hinges and a pilaster covering the meeting stiles: the Easterns, like the Greeks and the Romans, do not appear to have had any notion nearer than this of the rebated meeting stiles of modern times. Nor is any date given of the bivalve door, pl. 25, with sixty panels, to a merchant's house at Benares; this is evidently a pivot-hung door like those of deal formerly existing (destroyed 1837) in the Alhambra, and given with details by OWEN JONES, pl. 32-3. The peculiarity of ornamentation belonging to this example is also seen in the celebrated gates of Somnauth, which have been given by RICHARDSON, in the *ARCHÆOLOGIA*, 1843, xxx, pl. 14, 15.

## DOORS OF METAL.

## ITALY.

Place.	Building	Position.	Material, etc.	Subject and Inscription.	Date, Artist, Authority, etc.
VENICE	S. Marco	Centre of W end	Bronze, inlaid with silver	Saints of the Latin church. LEO DI MOLINO HOC OPUS FIERI JUSSIT.	Venetian work, 13th century. CIGOGNARA, i, 421.
"	"	On right of principal entr.	Bronze, inlaid with silver; 28 panels	Greek saints, patriarchal crosses, etc.; rich arabesque borders, and bosses of lions' heads.	Brought from Sta. Sophia, Constantinople, in 1203, by Dandolo. CIGOGN. i, pl. 7, 340.
"	"	External, W. end	Bronze	MASTERS BERTUCCIUS AURIFEX VENETUS ME FECIT.	Bertuccio, a Venetian goldsmith, 1300. CIGOGN. i, 420.
"	"	Baptistry	Bronze, in 2 valves, 3 panels in each of perforated work	Lattice work below and semicircles filled with lys above; projecting bosses on margins.	ARCH. PUB. SOC., <i>Illustrations</i> , 1858-9. 6th to 8th century (?). These doors were possibly brought to Venice from S. Marco's, Alexandria, in 829, or may have belonged to the original church of San Teodoro at Venice. MS. Notes.
"	"	N. end of N. transept	Bronze, in 2 valves, 3 panels in each of perforated work	Somewhat similar to last, but no lattice work; corded border to panels; bosses on margins.	Sansovino, 1556. CIGOGN. ii, pl. 72.
"	"	Sacristy	Bronze, 15 panels	Burial and Resurrection of our Saviour, with rich borders containing busts of Titian, Ariosto, and Sansovino, and figures of the Evangelists in high relief.	The entombment, etc. (now in Belle Arti).
PADUA	Del Servi Shrine	Talernacle	Bronze, in relief		Attributed to Donatello. CIGOGN. ii, 11.
"	S. Antonio	W. entrance	Bronze		Tiziano Aspetti, 1603. VOLKMAN, <i>Hist. Nachr.</i> ii, 645; CIGOGN. ii, 344.
VERONA	S. Zénone	In the choir	Bronze	The Bible; legends of the saints, lions' heads, and pierced borders.	The same.
FLORENCE	Baptistry	S. side	Bronze, in relief; 28 panels	The history of S. John Baptist, the Cardinal Virtues, from designs by Giotto.	Probably of 11th or early in 12th century. GAILHABARD, <i>Arch. du Veau XVIe Siècle</i> .
"	"	N. side	Bronze, in relief; (first pair) 20 panels	The New Testament, with figures of the Evangelists and the four Doctors of the Church (subjects selected by Aretino); rich borders of fruit and flowers.	Andrea Pisano, in 1330. CIGOGN. and GAILHAB. <i>L'Arch.</i>
"	"	E. side	Gilt bronze, in relief; (second pair) 10 panels	Scenes from the Old Testament; rich borders of heads, figures, birds, fruit and foliage, in highly figured reliefs (Prophets, Sibyls, etc.).	Lorenzo Ghiberti, 1402-24. LARINIO, <i>Le tre Porte</i> , etc.
"	Sta. Maria del Fiore	Sacristy	Bronze, in relief; 12 panels	The Madonna, the Baptist, Evangelists, four Doctors of the Church, etc.	Finished by Ghiberti, 1456. <i>Porta di Bronzo del Ghiberti</i> , Flor. 1772: D'AGINCOURT, pl. 41-42; CIGOGN. ii, 98.
"	San Lorenz.	Sacristy	Bronze, in 2 valves, in relief	Apostles, martyrs, and confessors.	Luca della Robbia, 1446-64. CIGOGN. ii, pl. 34.
PISA	Duomo	W. entrance	Bronze, in relief (3 pair)	The centre pair contain in eight panels the history of the Virgin Mary, the doors right and left in six panels each, the life of the Saviour.	Donatello, circa 1440. <i>Ansticht über die Bildenden Kunst</i> , in <i>Ital.</i> , 164.
"	"	Transept of S. Rainerio	Bronze, in relief, inlaid with silver; 20 small panels and 4 large	The Scriptures. One of the original doors of the entrance saved in the fire of 1596. The four large panels represent Christ entranced, the Assumption, and the twelve minor prophets.	Giovanni di Bologna, 1602.
LORETO	Duomo	Three in the principal front	Bronze, in relief	The Old and New Testaments, and the life of the Virgin, with very rich borders.	Bonanno of Pisa, 1180, according to CIGOGNARA. D'AGINCOURT, iii, 474 (Prato ed.), with more reason, thinks it Byzantine; and the one about 100 by Goffredo Baglione. CIAMP. i, pl. 20.
ROME	Pantheon	Prin. entr.	Plain bronze panels	Rosettes and studs on stiles and rails.	Giacomo & Antonio Lombardo; Antonio Bernardini, and Tiburzio Vercelli, circa 1600. CIGOGN. i, 205.
"	S. Pietro	Centre at E. end. Belonged to old basilica	Bronze, in relief; 6 large panels	Figures of Christ, the Virgin, SS. Peter and Paul, etc. The borders contain historical and allegorical subjects, in small panels with scroll foliage.	Roman work, 1st century. DONALDSON, <i>Doors</i> , pl. 17-19; TAYLOR & CHURCH, <i>Rome</i> .
"	S. Paolo	Princip. front	Wood, faced with bronze damascened with silver on engraved outlines	Life of Christ, figures of Apostles, Evangelists, Prophets, in 54 compartments; but few fragments have escaped the fire of 1823.	Antonio Filarete and Simone Donatello; executed for pope Eugenius IV, 1431-1447 (1445). CIGOGN. ii, 65; VASARI, <i>Vite</i> .
"	S. Giovanni E. end in Laterano		Bronze, plain panels with rich border of scroll foliage	Doesses on the narrow margins to panels, and stars on stiles and rails.	Made at Constantinople in 1070, by "Stauratus the Founder of Chios, brought to Rome by Hildebrand in 1073, as the gift of the Consul Pantaleone. D'AGINCOURT, <i>Sculpture</i> , pl. 13, 23.
"	"	Side chapel in baptistry	Bronze, with 6 panels partly in relief, partly incised	Figures under Romanesque canopies; one figure only remains; the ornament very remarkable. Inscriptions record names of pope and artists.	Roman work, 1st century; brought by Alexander VII, 1655, from the ruins of the <i>Æmilian basilica</i> .
"	"	Chapel of S. John	Bronze, in 4 panels, inlaid with silver crosses and letters	IN HONOREM BEATI JOHANNIS BAPTISTÆ	Pietro and Uberto, made by order of Celestine III, 1195. D'AGINCOURT, <i>Sculpture</i> , pl. 21, 7; ARCH. PUB. SOC., <i>Illustr.</i> , 1858-9.
"	"	Corsini chap.	Bronze, partly gilt	PERFORATIS PANEIBUS ET BORDIBUS IN SCREEN SEPARATING THE CHAPEL FROM THE NAVE.	The inscription appears to record its gift by pope Hilarius, 461-68.
"	S. Theodoro		Bronze		
"	SS. Cosmo e Damiano		Bronze, in 4 panels	Enriched moldings and rosettes.	
BENEVENTO	Duomo	Centre	Wood covered with bronze, reliefs in 72 panels	The Scriptures, figures of the archbishop of Benevento and 24 suffragan bishops; lions' heads with rings.	From the designs of Alessandro Galilei, 1734. GRUNER, <i>Orn. Art.</i> , pl. 62.
NAPLES	Castel Nuovo		Bronze relief	Life of Ferdinand I. of Naples.	Etruscan workmanship found at Perugia. Given by Adrian I, 780, but of earlier date and of classic workmanship. DONALDSON, pl. 20.
MONTE CASINO	Duomo	Centre	Bronze, engraved & damascened with silver	Floriated crosses in panels, and the names of castles and estates belonging to the monastery. HOC FECIT MAURUS FILIUS PANTALEONIS DE COMITE MAURONE AD LAUDEM DNI ET SALVATORIS NRI IHS XPI AD CUIUS INCARNATIONE ANNO MDLXII SEXAGESIMO SEXTO.	Italian work, 1334, according to CIAMPINI, <i>Vet. Mon.</i> ii, 9, but of earlier date according to SARNELIUS, <i>Chron. Eccl. Ben.</i> , p. 95.
"	GARGANO	Sanctuary	In the screen		Guglielmo, a monk, end of 15th century. CIGOGN. ii, 191.
TROJA	Duomo	Princip. front	Bronze, open work		Made at Constantinople by order of the abbot Didier, 1060 (in imitation of those at Anafli, which he saw in 1062). MS. Notes. D'AGINCOURT, etc., passim.
"	"	"	Bronze		11th century. Two dated 1119 and 1127. SERRADIPALCO, p. 62.

## ITALY (continued).

Piace.	Building.	Position.	Material, etc.	Subject and Inscription.	Date; Artist; Authority, etc.
CANOSA . . .	Tomb of Bohemond in atrium of duomo ( <i>S. Sabino</i> )	Entrance	Bronze, pannelled; rich borders with medallions enclosing animals and birds	Old and New Testament and inscriptions. GUINPARDI CONJUX, ALBERADA, HAC CONDITOR ARCA; SE GEMITUS QUARIS, HUNG CANISIKUM HABET. MELEPE CAMPAN BOGEHUS THIE HAS PAN SUE PANTALEONE M. LATO DITE JO ROC OPUS FIERI JUSTI PRO REDEMPTIONE ANIME SUE PANTALEO FILIOS MAURI DE PANTALONE DE MACRO DE MAUROME COMETE. Our Saviour, the Virgin, saints, etc.	Bohemond, son of Guiscard, died in 1111. Made at Melit, but have a decided Saracenic character. (See the wood door in p. 161, l. 1.) About 1000, as they existed when Didier of M. Casino visited Amalfi in 1006. <i>MS. Notes.</i> SERRADIPALCO states the foundation—BIBLA 1314 AD 1006
AMALFI . . .	<i>S. Andrea</i>	Principal entrance	Bronze, panels engraved and damascened with silver. Traces of colour		Dated 1087. <i>MS. Notes</i>
ATRANI . . .	<i>S. Salvatore</i>	Principal entrance	Wood covered with plates of bronze, pannelled	ANNO AD INCARNASIO DEI XPI XII MILIESIMO OCTIDIESIMO SEPTEMO, MENSE FEBRUARIO INDE DECIMA NOC OPUS FIERI JUSTI, PANT. FILL. PANT. VIARECTA P MERCED ANIME S. ET NABILIS S. ANNI VALERIS.	
RAVELLO . . .	<i>S. Pantaleone</i>	Principal entrance	Bronze on wood, panels in relief, and rich borders	34 panels of Scripture subjects, Apostles, and figures of warriors, lions, etc. ANNO MILLESIMO CENTESIMO SEPTAGESIMO NONO INCARNATIO JESU XPO DNO NRO MEMENTO DNE FAMULO TUO SERGIO MUSETULC ET UXORI SUE SICILI GAUBIE ET FILIIS SUIS MAURO ET JOHES ET FILIA STA ANNA QOT ISTA PORTA FACERE AGIT AD HONOREM DEI ET SANCTE MARIE VIRGINIS.	Dated 1179. By Barisanus of Trani, the founder of the Monreale north door which it closely resembles. ARCH. PU. Soc., <i>Illustrations</i> , 1850-51
SALERNO . . .	<i>S. Matteo</i>	Principal entrance	Bronze, panels incised and inlaid with silver	Figures of Apostles, etc.	Presented to the duomo in 1009 by Lando. <i>Litter. Mus. et Libr. Ital.</i> , 1811
TRANI . . .	<i>Duomo</i>	W. entrance	Bronze, panels in relief, etc.	Similar in style and subjects to the doors at Ravello and Monreale. Inscribed with the name of Barisanus the founder.	Barisanus of Trani, 1170-1180. SERRADIPALCO, <i>Del Duomo di Monreale</i> .
MONREALE . . .	<i>Duomo</i>	W. entrance	Bronze, reliefs in 44 panels	The Scriptures, and small figures of patriarchs and prophets, arabesque divisions, and rosettes on margins. A.D. MCCXCVI. IND. III. BONANVS CIVIS VISANTIENSIS HE FECEIT.	Bonanus of Pisa, 1186. GAILY KNIGHT, pl. 24. SERRADIPALCO, <i>Del Duomo di M. a. Sicil.</i> , p. 1
" . . .	"	N. door	Bronze, 28 panels, each enclosed in a rich border	Our Saviour in glory, the Crucifixion and Resurrection; the Virgin, Elijah, St John Baptist, and 12 Apostles; S. George and S. Eustace on horseback, etc.; with names of the saints, etc. In Latin. ITALY'S ARTS AND MONUMENTS, fig. 100, 111.	Barisanus of Trani, about 1179. Very similar to the Ravello doors; some of the panels appear identical. SERRADIPALCO, p. 12
PALERMO . . .	<i>Capella Palatina</i>	Side entrance	Bronze		12th century
CONSTANTINO-PLE.	<i>Sta. Sophia</i>	S. end of narthex	Bronze, in 4 panels with moulded borders, rich frets of scrollwork, the whole of fine workmanship	TURKEY. Circles enclosing crosses and monograms; above MIKHAHIKHTN; all inlaid in silver.	9th century, Michael III. SALZENBERG, pl. 17. The original doors of Sta. Sophia were of wood
" . . .	"	Innertium	16 bronze doors, with crosses on panels	The crosses have been mutilated by the Turks.	MURRAY, <i>Handbook, Turkey</i> , p. 74
BETHLEHEM	<i>Ch. of the Nativity</i>	Screen betw. ch. & grotto	Bronze	PALESTINE. Open geometrical ornament.	5th or 6th century. GAILLARD, <i>L'Arch. du Ve au XIIIe Siecle</i>
CAIRO . . .	<i>Mosque d'el Khankeh</i>	Principal entrance	Bronze on wood, one panel each	EGYPT. Rich arabesques, open work.	Early in 16th century. GAILLARD, <i>L'Arch.</i>
KOUS . . .	<i>Mosque</i>	The maktourah	Bronze, in two valves on wood	The same.	15th or 16th century. <i>Idem.</i>
AIX LA-CHAPELLLE	<i>Cathedral</i>	W. entrance	Bronze, in large panels surrounded with moulded borders enriched in imitation of Roman cyma	GERMANY. Projecting lions' heads, with rings in centres of panels.	Given by Charlemagne; in imitation of Byzantine work. BEGINART says, ex arch solido januis ornavit, Vita Imp. Kar. Reg. Mag. GAILLARD, <i>L'Arch. du Ve au XVIe Siecle</i>
HILDESHIM	<i>Dom</i>	W. entrance	Bronze, in relief with panels, 8 to each valve (NESSITT says 12)	The Scriptures; lives of Adam and Christ.	Presented by bishop Bernward in 1016. OTTE, I, 290; FORBELL, i, 87
AUGSBURG . . .	<i>Dom</i>	S. entrance W. end	Bronze, in relief with 33 panels or compartments of bas reliefs and two for handles	The Deluge, life of Sampson, etc.	Made by Augsburg workmen for the bishop Henry I. in 1008 (NESSITT, <i>Archæological Journal</i> , 1852); De CACOMOT says 1070. QUAGLIO, pl. 9
MENTZ . . .	<i>Dom</i>	—	Bronze	Lions' heads, and a border. The Latin inscription added by the archbishop Adalbert, 1135.	Given by archbishop Willigis, 997-1011. FORBELL, i, 82; MYLLER, pl. 8
PETERHAUSEN	<i>Conventual-ch.</i>	—	—	Coats of arms in diaper.	Given by Gebhard, second bishop of Constance, 940. FORBELL, i, 205
NUREMBERG	<i>S. Sebald</i>	Sacerist	Iron (?) in low relief	History of S. Adalbert, with border of foliage.	Circular 140(?)?. NESSITT, <i>Arch. Journ.</i> 1852
GNESEN, Poland	<i>Dom</i>	S. side of nave	Bronze, reliefs in 18 panels		1150-1200; cast at Magdeburg (?). NESSITT, A.J., 1852; BAUZEITUNG, 1845, pl. 690
MOSCOW . . .	<i>Kremlin</i>	—	Bronze reliefs	RUSSIA. Biblical.	Brought from Greece by Vladimir the Great in 997. NESSITT
" . . .	"	—	—	—	Cast by Aristotiles, an Italian, in reign of Basil Ivanovitch. NESSITT
NOVGOROD . . .	<i>Sta. Sophia</i>	W. end	Bronze reliefs on wood in 20 compartments	Scriptural and mythological. Figures of bishops and warriors. Has portraits of Archb. Wichman of Magdeburg, and also of Riquin and Waismuth. Latin, and later in Russian	Made by Riquin, Waismuth, and Abraham, in 1100. German workmen (Otte, p. 181-299). ADELUNG, pl. 1
" . . .	"	Entr. to chap. the Birth of the MP ΘΥ	Bronze, very flat relief, in six panels and border	Crucifix of peculiar form, resembling those of S. Paolo at Rome.	Byzantine origin. ADELUNG, pl. 9
SUSDAL . . .	<i>Cathedral</i>	—	Bronze, inlaid with threads of gold	The Scriptures.	Brought from Greece in 997 by Vladimir. NESSITT
ALEXANDROWA	<i>Ch. of the Trinity</i>	—	Bronze	Figures of saints.	Cast in 1335, by order of Basil, bishop of Novgorod. NESSITT
TOLEDO . . .	<i>Cathedral</i>	—	Bronze, reliefs on wood	SPAIN. The inside woodwork carved, tournaments, centaurs, etc.	By F. de Villalpando, 1545. MURRAY, 786
CORDOVA . . .	"	5 in various parts of building	Bronze, on covered with rich ornament, now plain plates	—	Coeval with foundation, in 787

This list, as far as it goes, is believed to be correct. Those previously given in ADELUNG and the *Archæological Journal* are full of errors, and very defective; indeed the difficulty of obtaining accurate information upon this subject, owing to the

strange neglect with which it has been treated by architectural students, and the scanty and imperfect notices found in such authors as CIAMPINI, CICOGNARA, D'AGINCOURT, and others, renders the correct compilation of such a list a work of extreme



difficulty. This neglect is the more remarkable, inasmuch as such doors are interesting, not only in an archaeological, historical, and artistic point of view, but the doorway forms so important a feature in *design*, that it is surprising that these evidences of the importance with which the subject was invested during the middle ages have not been made a more marked object of study. Besides the examples herein adduced, there are notices in various authors of similar works now destroyed. The doors of the old basilica of S. Peter's at Rome, covered with embossed plates of silver; the bronze doors of the duomo at Pisa, by Bonanno; the bronze doors made by order of Suger, for S. Denis near Paris, in 1140; and many others which might be cited, tend to prove the importance of such works produced in former times. A complete and well illustrated monography of this branch of art is still a desideratum, and would be a valuable addition to literature. The subject is incidentally treated in KUGLER, *Handbuch*, 8vo., Stuttgart, 1842; and in WYATT, *Metalwork*, fol., London, 1852. J. M. L.

DOOR BAR. The simplest mode of fastening a door is by a bar, either of wood or of iron. VIOLETT LE DUC, *Dict.*, s. v. *barre*, gives three illustrations of mediæval doors; one, a folding door, being secured by a bar fixed on one leaf; another by a SWING-BAR such as is still used for coach-house and some other doors; and the third by a bar sliding into the wall; the latter, made of iron and having one end divided so as to let half of it swing, is still in use under the name of a SPLIT-BAR, as one of the safest modes of fastening large doors and shutters. CAT-BAR.

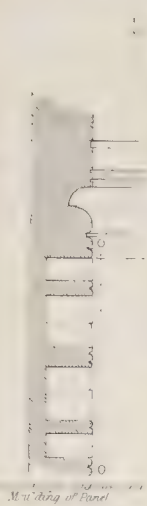
DOOR CASE and DOOR FRAME. The name formerly given by carpenters and joiners to the solid wooden frame to which a door was to be hung: in some cases a cill was, and is, part of this frame, consisting further of a head and two jambs or posts, secured together by mortises and tenons; the jambs and head, in old work sometimes the jambs only, are rebated for the reception of the door and beaded both sides, when they are called a *proper* solid wrought, framed, rebated and beaded frame (HORN, SIDE-ARM); and the head and jambs are sometimes ploughed for plastering or for linings. In former times this solid frame was set in a doorway prepared without a reveal in the wall; and had its outer, as well as its inner, face frequently treated as a dressing, when the whole arrangement was called 'an architrave doorcase': but at present, a solid door frame, which is chiefly used for external and cellar doors, is usually set in a reveal, but very often otherwise in small houses. The doorcase of modern times properly consists of grounds for the architrave, and dovetailed backings for the jamb linings, but of late, in some large buildings, these have been abandoned for wood-bricks, and at present even for wedges in thin walls or partitions, which is not so excusable as in thick walls, where the plastering is to be carried round the brick jambs. The use of the term doorcase, in masonry with reference to the dressings of a DOORWAY, has been attended with inconvenience.

DOORWAY (It. *entrata*; Sp. *entrada*). The entrance to a building, apartment, or enclosure. The enormous doorways which were executed in classic times, such as that at Ancyra, 10 ft. 9 ins. wide and 28 ft. 3 ins. high (TEXIER, *Asie Mineure*, fol., Paris, 1839, i, 66-8); that at the entrance on the west flank of the temple to the Sun at Palmyra, about 14 ft. wide and 28 ft. 6 ins. high; and that to the small temple at Baalbec, about 21 ft. 3 ins. wide, and perhaps double that amount in height, had their lintels usually in one piece and the jambs of as few pieces as possible; at Ancyra each jamb is in two pieces. The Vitruvian text on this subject may best be studied in DONALDSON, *Doorways from Ancient Buildings*, 4to., London, 1833, who says that "although we have not at this period instances of other than stone or marble dressings, yet a minute examination of the doors to the temple of Minerva and the Propylæa in the Acropolis at Athens, and to the Sicilian temples, left no doubt upon the mind of the author, that they were

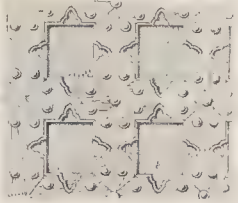
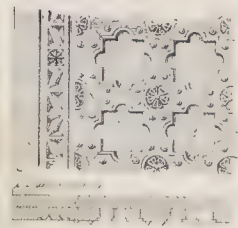
decorated with metal jambs." In several cases, where under 30 ft. high according to the canon of VITRUVIUS, as at the tetrastyle portico of the Erechtheum at Athens, and at the temple to Vesta or to the Sibyl at Tivoli, the doorways have inclined jambs, a feature which is reproduced in the noble *portone* at Loreto, dating about 1578 (*Illustrations*, 1848-9), which is about 9 ft. 4 ins. wide by 23 ft. high. This, as well as that of the Farnese palace, which it greatly resembles, is given in DONALDSON, *Doorways from Modern Buildings*, 4to., London, 1836, with examples of several of the finest doorways and doors dating from the period of the Renaissance. A very good chapter on the dressings of doorways in the style peculiar to the seventeenth century in London, is given in the *BUILDER Journal*, 1844, ii, 613. Illustrations of some of the splendid doorways belonging to the Mahometan style of oriental architecture are given from Benares, with enriched architrave and molded jambs, by KIRTOZ, *Illustr.*, fol., Calcutta, 1837, pl. 25; from Nigdé and Konieh, by TEXIER, *Asie*, ii, 95-105; and from Erzeroum, Tabriz, Sultanieh, and Ispahan, by the same author, *Arménie*, fol., Paris, 1842, pl. 7-10, 43-6, 56, 71-8.

With regard to a house or other erection, it seems not inexpedient to perpetuate the old maxim that the doors be few in number, moderate in dimensions, sufficiently removed from the angles of external walls ("a precept well recorded, but ill practised by the Italians themselves, particularly at Venice") and as much as possible over one another, with arches over each opening. In unimportant apartments the door may be placed as near a return side of the room as may be allowed by the dressings, etc., especially if it is to open against that side: but in rooms of more pretension, a space of about 2 or 3 ft. at least, in general from 3 to 4 ft., should be left, for strength in brickwork, for convenience in trussing partitions, and for the location of some article of furniture or decoration in the corner. The system of placing doorways in a file next to the outer wall of a mansion appears to have been introduced in England from the continent about 1675-95, if not earlier: it has some merits where the use of the apartments is not much interfered with in small houses, or in buildings which are lighted solely from one side; but the modern fashion of placing doorways, that are to be opposite each other, in the centre of the apartments, seems preferable for large houses, and except in the throne room or reception room, for state occasions. With regard to the usual sizes of doorways, it may be observed that an old French rule prescribed a width of 3 ft. for chambers, and for outer doors in small buildings, 5 ft. as a medium, and 7 ft. for external doors in large edifices, with 7 to 8 ft. in churches: but the dictum of LE MUR, introduced into England by PRICKE, *Art of Fair Building*, fol., London, 1670, p. 2, is still generally observed: he says that "the doors within the lodging shall have two feet and an half of breadth, and three feet at the most, in great buildings four feet:" these are of course French feet equal to 2 ft. 9 ins., 3 ft. 3½ ins., and 4 ft. 4½ ins. Modern external doors are rarely ordered to be more than 8 ft. 6 ins. by 4 ft. 6 ins., and are usually 7 ft. 6 ins. by 3 ft. 6 ins.: while 7 ft. by 3 ft. is a very common size for internal doors, and 6 ft. 9 ins. by 2 ft. 10 ins. is the least that is admissible in the common rooms of a private house. It has been observed by LECLERC, and the observation still holds good, that the poorest external doorway of a house should, at least range in height with the accompanying windows, and should be rather wider than those apertures. *Illustrations*, 1857-8 and 1858-9. ARCHITRAVE.

DOOSH. The name given to the site of the most southerly temple (almost opposite to Edfo) in the Great Oasis of the African desert. HOSKINS, *Visit*, 8vo., London, 1837, pp. 151-9, describes and illustrates, not very intelligibly, staircases and galleries within the thick brick wall that encloses an area about 200 ft. by 180 ft. which contains the ruins, chiefly consisting of some brick chambers showing a Pointed arch, and of a temple to Serapis, Isis, and Horus, with inscriptions in which Domitian, Trajan, and Hadrian are named.



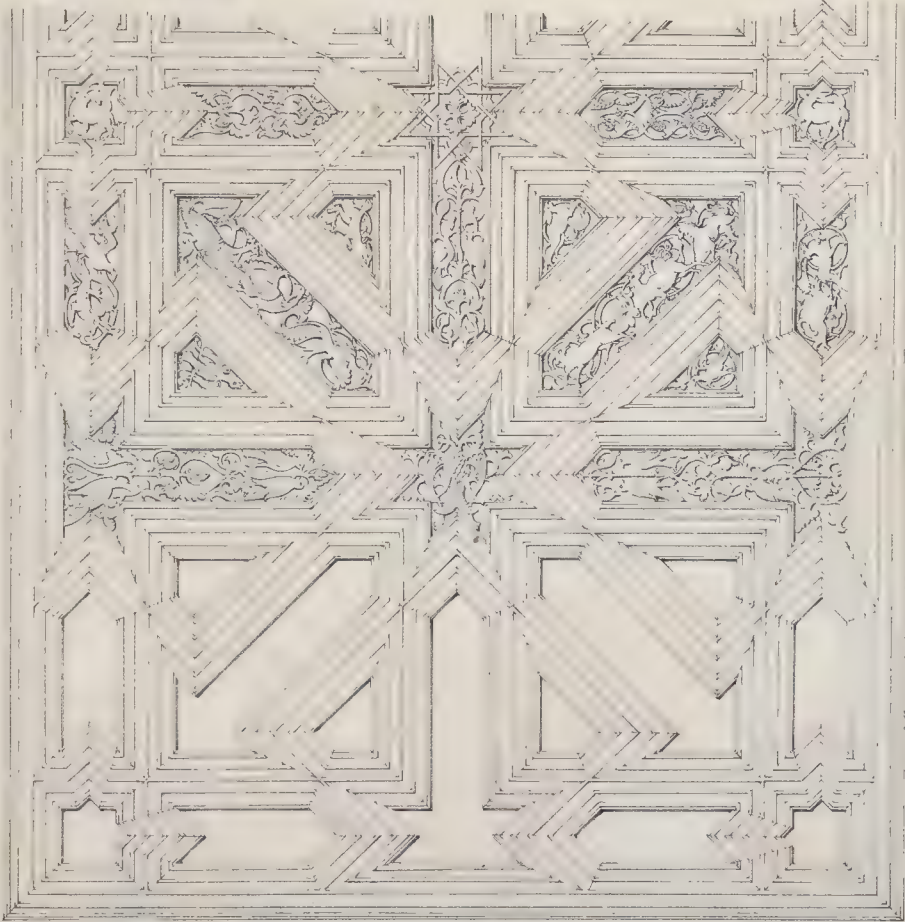
Decorative Courtyard,  
VERONA



Modeling of Panel

16 2 CH Panels

3



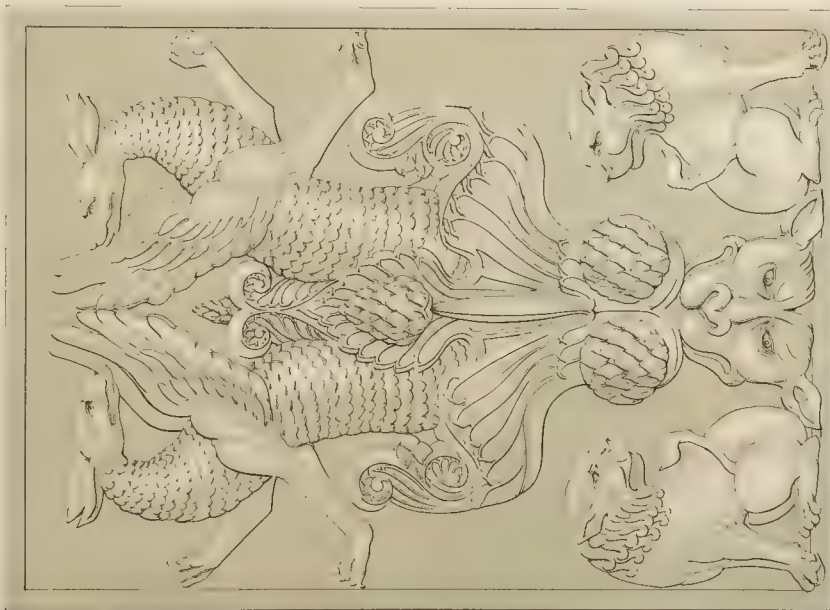
Panel of a Door from the Norman portion of the Palazzo, Reale, PALERMO.  
(XII. cent.)

3. M. Lachner-John M.B.A.

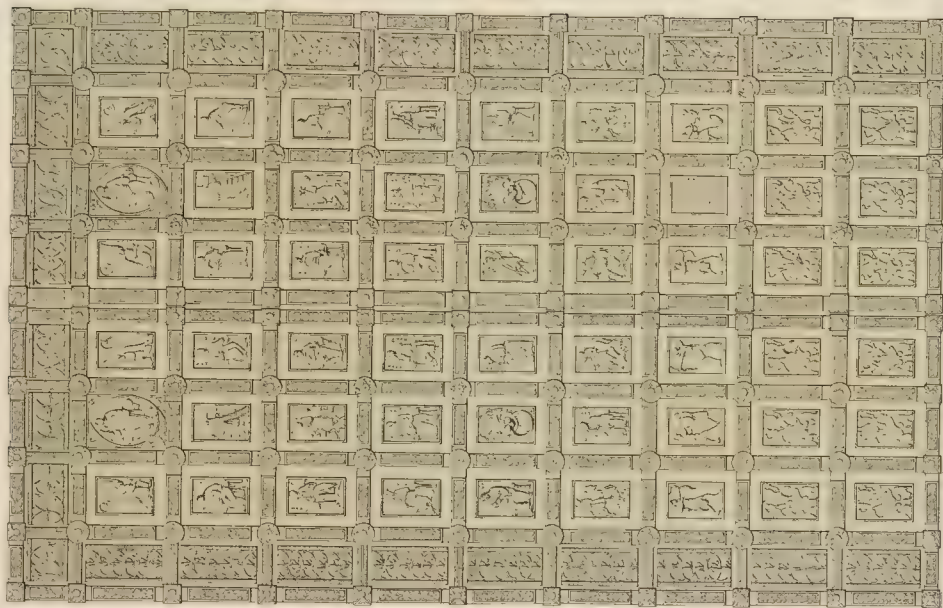




DOOR



ORNAMENTAL PANEL  
CABINET OF THE UNIVERSITY OF CHICAGO



DOOR  
CABINET OF THE UNIVERSITY OF CHICAGO





DOOR

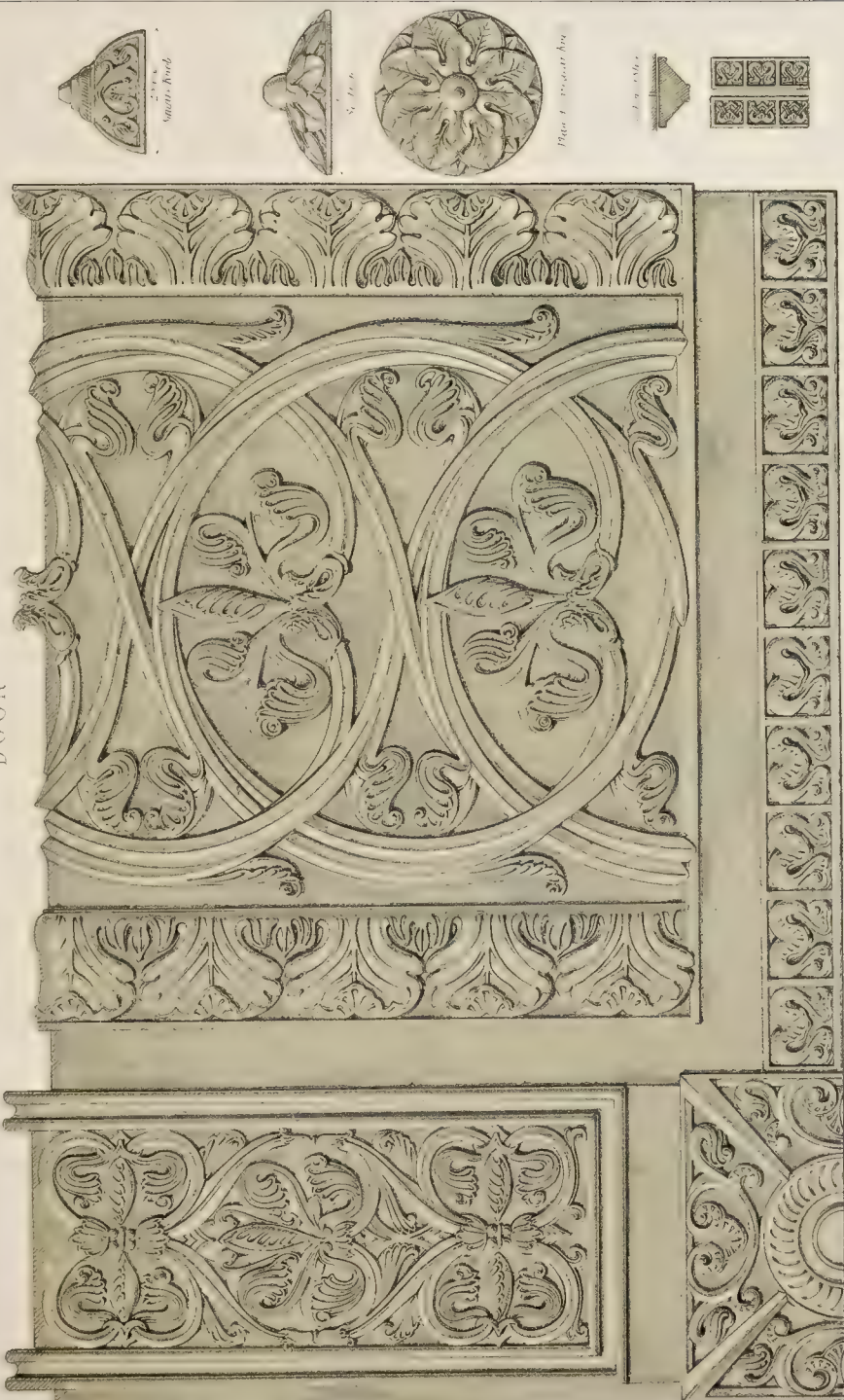


Figure 1. Present Day







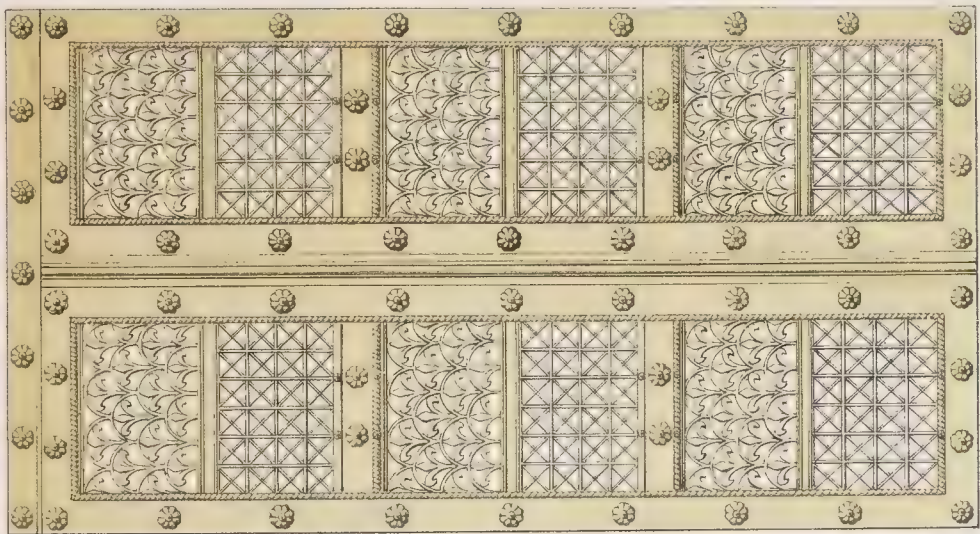
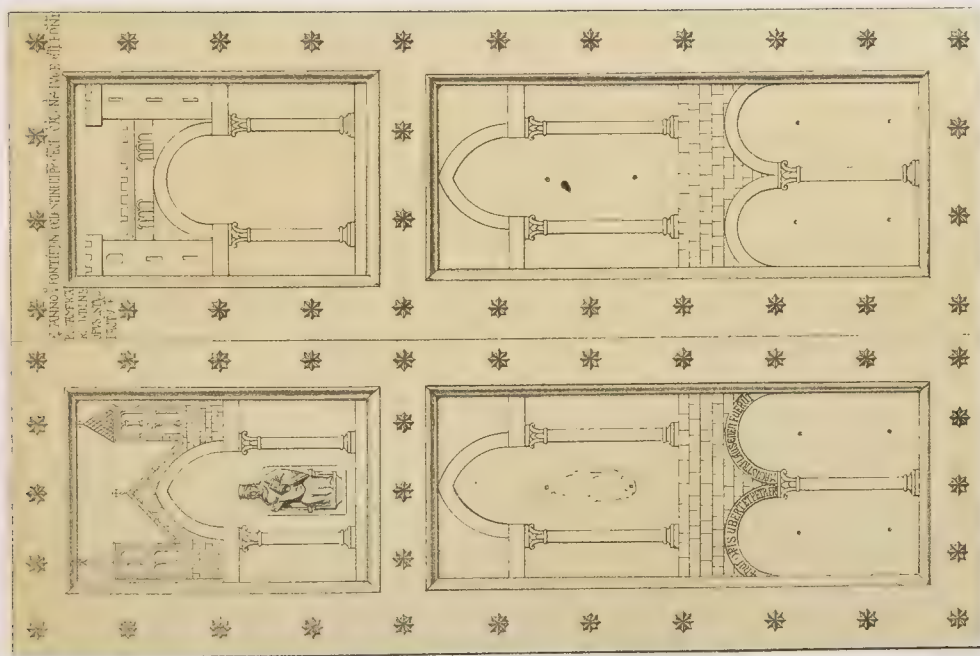
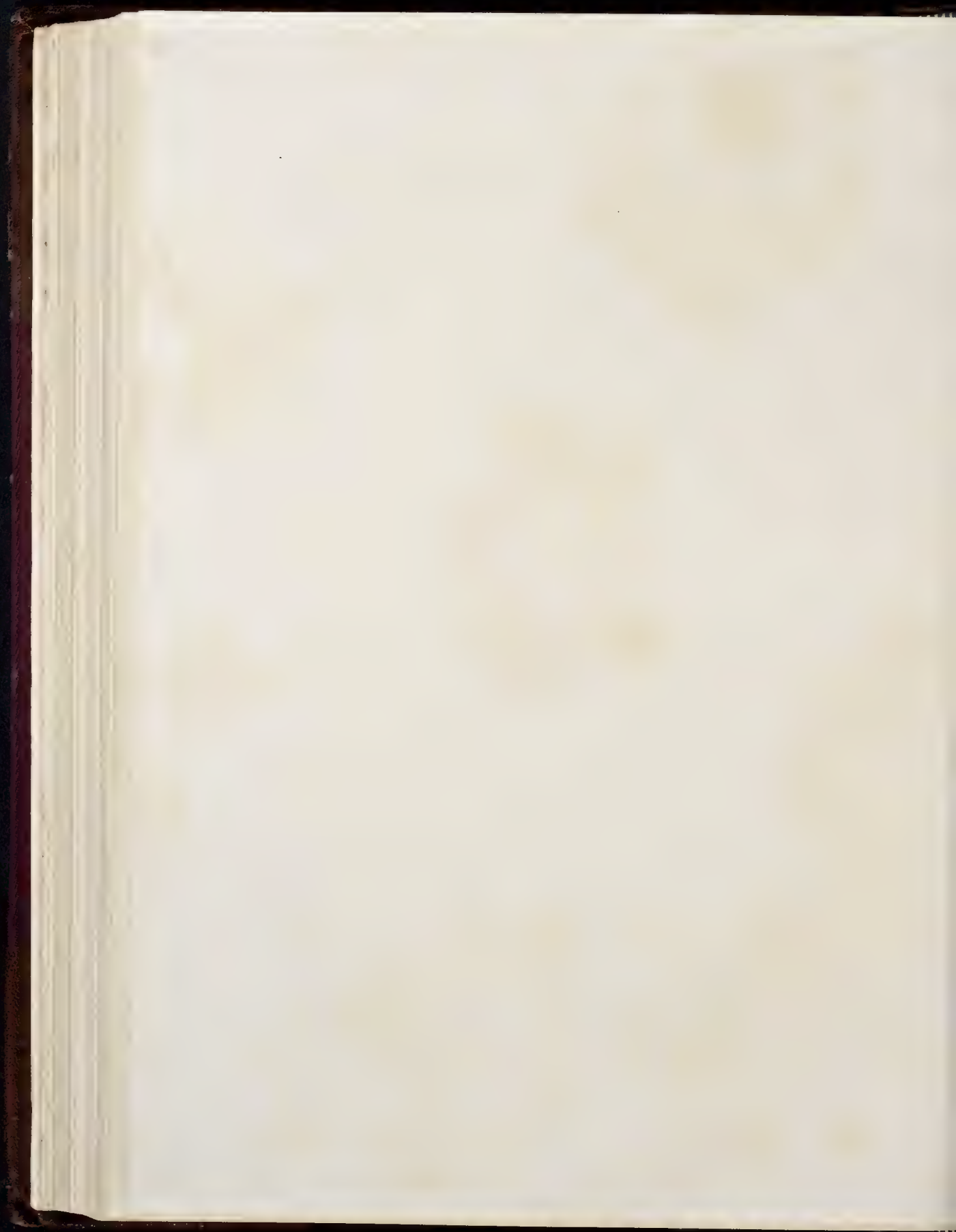
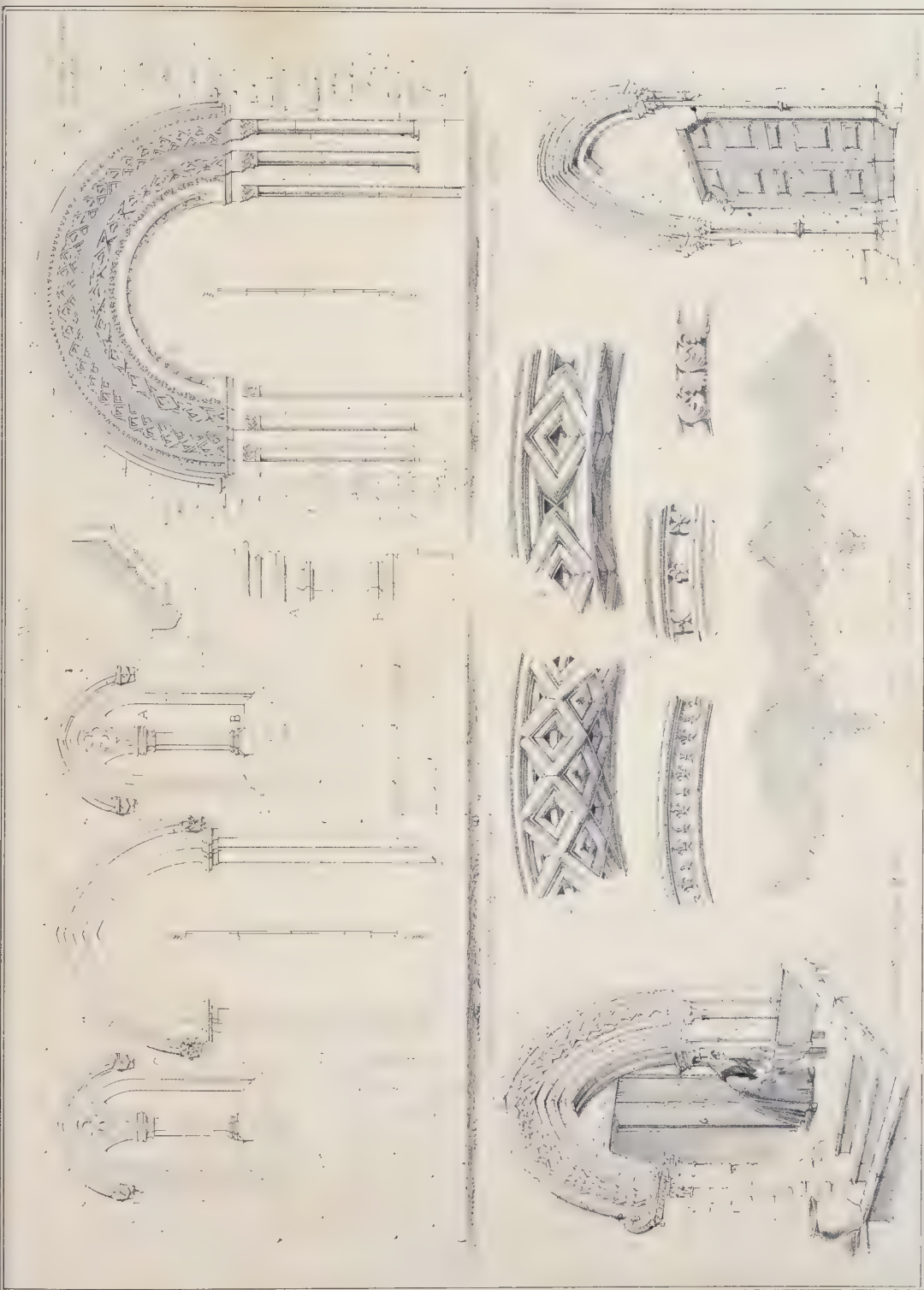


PLATE  
17



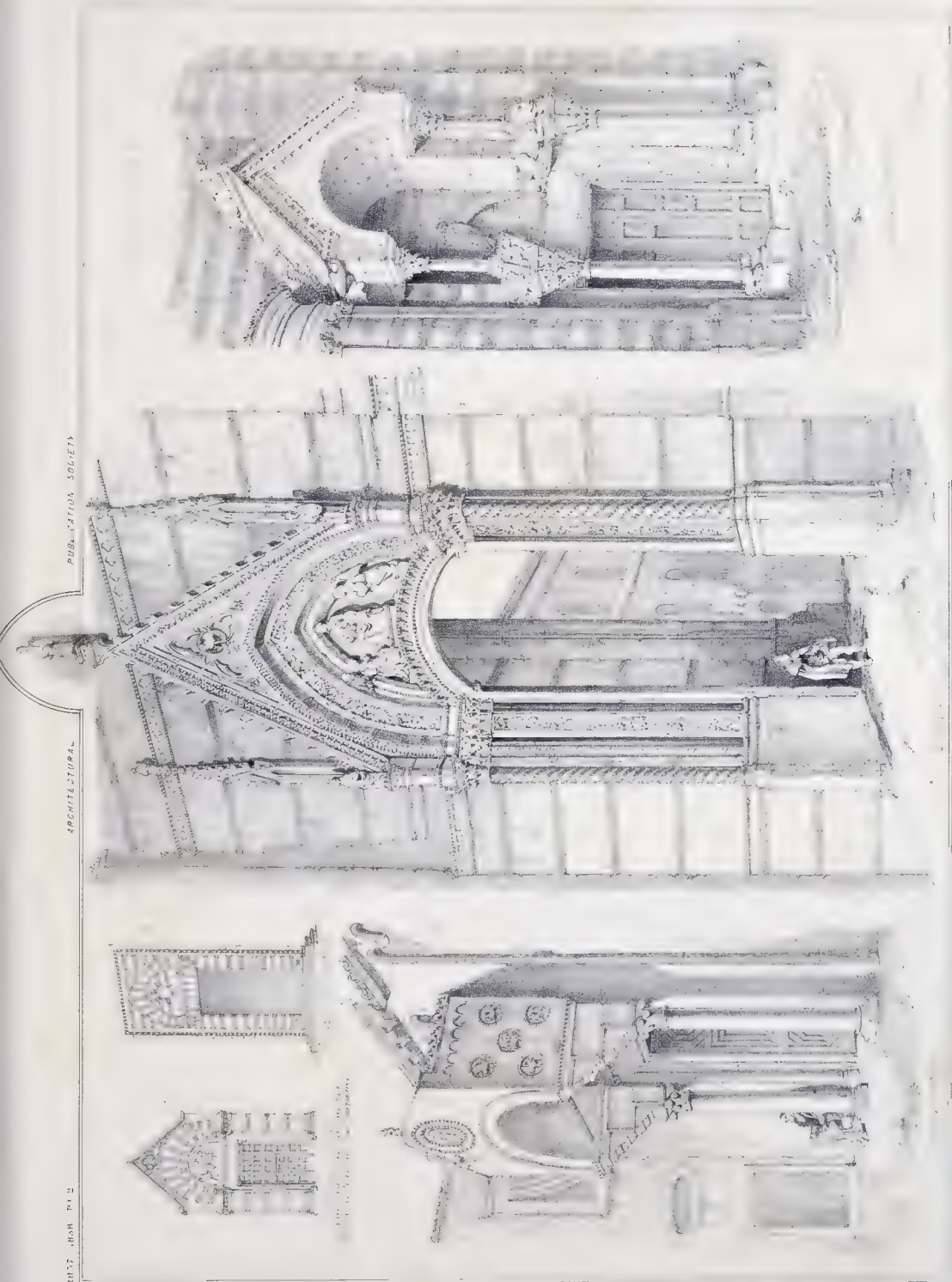
















PLATE



PLATE





DORBAI or DORBAY (FRANÇOIS), sometimes called D'ORBAY and D'ORBAY, was one of the best pupils of Le Vau or Leveau (who died 1670), for whom he superintended the execution of several works which have been consequently ascribed to the pupil although they were really designed by the master. Among these D'ARGENVILLE, *Vies*, 8vo., Paris, 1788, enumerates the église des Prémontrés de la Croix-Rouge, 1661, destroyed 1719, which is given as the seventieth subject in the *Grand Maret*; the Chenil-neuf at Fontainebleau, 1679; the Capuchin nunnery and church, place de Vendôme, commenced 1686, and finished 1688; the former hôtel des Comédiens-français, 1688; the collège des Quatre-Nations and its church; and finally various works from 1664 (especially the addition in height) to the Tuileries. This writer does not absolutely give to Leveau the credit of the portico of the church of the Carmélites executed 1682 at Lyon, under Dorbay who designed, as he allows, the porte du Peyrou at Montpellier 1692. BRICE, *Description*, 12mo, Paris, 1725, i, 503, notes also the door, 1671, to the church of the hôpital de la Trinité, rue S. Denys. Dorbay was one of the eight original members of the Academy of Architecture in Paris, founded 1671, his colleagues being Blondel, Leveau, Gittard, Le Pautre, Mignard, and Felibien. The dates 1694 and 1697, sometimes stated as the year of his death, are contradicted by BRICE, who like the register of the Academy gives 1698. VIRLOYS, *Dict.*, s. n., ascribes to Leveau the designs for the Quatre-Nations only; and noticing that the works at the Louvre and Tuileries were continued after the death of his master by Dorbay, ascribes to the latter the *œuvre* or warden's pew (decorated afterwards by C. Lebrun) at S. Germain l'Auxerrois, where he was buried, and the other works above named at the Capuchin nunnery, hôpital de la Trinité, la Croix-Rouge, and hôtel des Comédiens. NAGLER, *Lex.*, intimates that Dorbay was able to introduce several parts designed by himself in the Quatre-Nations, and in the Tuileries, both in the façade and in the continuation of the works begun by Leveau for the connection of that palace with the Louvre. 45.

His son, NICOLAS DORBAY, chevalier of the order of S. Michael and contrôleur des bâtimens du roi, was elected 1705 into the Academy of Architecture, and died 1742, aged 63. 45. 68.

DOROSTOTHE. This term is explained as the wooden cheek or upright post of a door frame, by the SURTEES SOCIETY, *Priory of Finchale*, 8vo., London, 1837, pp. 355, 427.

DORIC ORDER. The least decorative, or rather the most simple in decoration, of the three columnar orders employed by the ancient Greek and Roman architects. Even in the time of VITRUVIUS, iv, 1, the name was derived from the traditional inventor, Dorus, son of Hellên and Orseis, or, as some copies have it, Optice. The opinions regarding the expression, by this order, of an influence arising from preceding timber construction on the one hand, or from Egyptian masonry on the other, will be considered *s. v.* PROTODORIC. DRYOPIC.

The order, in its accepted type, the Parthenon, consists of a baseless pillar having twenty flutes without fillets; a groove marks a necking immediately below the capital, which is formed by annulets below a flat ovolo and a square abacus; upon this rests an entablature consisting of the three usual parts, viz. an architrave which is plain; a frieze which is ornamented with sculptured metopes between triglyphs; and a cornice chiefly dependent, for its effect, on the corona and mutules. This combination exhibits, in the proportions of the parts and of their members, a nearer ratio of width to length than is exhibited in the corresponding features in the Greek Ionic or in the Greek Corinthian orders. Such a ratio, which is productive of the massive and solid character of the order, does not hold in reference to the spaces of intercolumniation, and consequently a further degree of massiveness and solidity is acquired. Fortunately for the interests of Art, it will be found, however, that on comparing examples of this order, they differ materially in the relative size of their parts, both in

ARCH. PUB. SOC.

general and in detail; and present discrepancies which cannot be reconciled upon any system of calculation, whether the general height of the order, the diameter of the column, or the height of the column be taken as the element of proportion.

With regard to particular variations of style, LEAKE, *Travels in the Morea*, 8vo, London, 1830, iii, 268-84, giving the reasons for his opinions as to the difficult question of the age of examples of this order, says, that Corinth was at that time (the beginning of the eighth century, B.C.) "the principal seat of the arts in Greece, and consequently furnished as well to her own colonies as to those from other parts of Greece, both models of Doric architecture, and a great portion of the artists. The changes which subsequent architects thought proper to make in the models originally taken from Greece, seem not to have been imitations of the contemporary improvements of the mother-country, but to have arisen from the views of taste and expediency entertained by the colonial artists themselves. Hence arose a style of colonial Doric different from that of Greece Proper; and of which in general the characteristics are, a shorter and more tapering column, a more spreading echinus, a smaller intercolumniation, a greater entasis, and a higher entablature." But in noticing the temples at Selinus, this author observes, that "two of them appear to furnish a remarkable exception to the other examples of colonial Doric, in having a wider intercolumniation, a lighter entablature, and a more slender shaft, though an equally spreading echinus in the capital. The architects of Magna Græcia appear in the fifth century to have begun to despise that simplicity and uniformity of design which are still remarkable in the two Acragantine temples. This deviation is very conspicuous in the plan and details of a heptastyle of Jupiter Olympius at Acragas, and in the enneastyle at Pæstum. The florid ornaments under the capitals of the columns in the latter temple, as well as in the smaller hexastyle at the same place, indicate a similar decoration. These, however, were elegant innovations; but the architect seems to have been deficient in the good taste of Sicily when he made the entasis, or swelling of the columns, so apparent that they look like a caricature of the Doric order."

In consequence of the paucity of purely Roman antique examples of this order, it will be convenient to include their peculiarities of detail in the following notice of those furnished by their Greek predecessors.

The shaft, which varies from four to six and a half diameters in height, has no base except at Kangovar, at the temple to Jupiter Olympius, and perhaps at the temple to Vulcan, both at Agrigentum; as well as at the doubtful example at Cora. It is decorated with sixteen flutes at Ægina, Pæstum, Segeste, Sunium, and Syracuse; with eighteen at Orchomenus in Arcadia; but with twenty in the majority of antique remains; twenty-four occur at the great temple at Pæstum, and at the baths of Diocletian. The flutes are always shallow, and generally meet at an arris, a peculiarity of the order, but with fillets in the remains at Priene, and also as narrow as possible at Rhamnus, and in the Propylæa at Athens. The shaft is left wholly or partially unfluted in instances at the oratory of Phalaris at Agrigentum, Albano, Cora, Delos, Rhamnus, and Troezen, and at the theatre of Marcellus and in the Colosseum at Rome: VITRUVIUS, iv, 3, directs that the Doric column should have each of its twenty 'striae' either a plane, or hollowed to arrises; and in the latter case gives precise directions as to finding the centres for striking the segmental-curved plan of the flute.

Groups may be formed, among the remains of classic works, by observing the treatment of the upper part of the column immediately below the echinus. The annulets vary in number from three to five in the various examples. Some shafts have no hypotrachelion or necking, there being no decoration of the joint that occurs where the top of the shaft receives the bed of the block out of which the capital is worked. Several have a groove at that joint. Other columns have two or more such grooves. One example at Pæstum has the whole of the necking



worked as a projection from the face of the shaft. Several more at the same place have the hypotrachelion decorated with a kind of fluting. Besides these, there are the Roman Doric remains, especially the peculiarly-worked capital in the museum at Naples. As VITRUVIUS, iv, mentions no ASTRAGAL to the necking, although he speaks of the hypotrachelion, of the Doric order, it is possible that in his time there was none, but merely a groove or grooves. The peculiarity of the abacus hollowed on plan in its four faces was found at Kangovar. If the echinus in the capital be essential to a Doric column, some other name must be found for the examples that have a chamfer, as at Delos and Pæstum; for that at the baths of Diocletian at Rome, which has a cyma-recta; and for that at Urgub (? Osiana) in Cappadocia, which has a cyma-recta, without any real abacus. At Cora a sort of necking is produced by the stoppage of the flutes at a short distance below the annulets. The examples of capitals at Nacoleia and at the tomb of the Apostles at Jerusalem are worth study. Instead of the annulets under the echinus, an astragal occurs at Kangovar, in a capital which is unique of its sort; and two such moldings at Priene.

Besides these variations, notice should be taken of a base, sometimes formed by the skirting, sometimes independent, to the anta, as at Athens and at Sunium; as well as of the capital to this portion of buildings having a Doric character: the differences in the capitals of Antæ in the Attic and Sicilian varieties are noticed *s. v.* ANTA. In the choragic monument of Thrasylus at Athens, the contrast usually afforded by triglyphs is supplied by wreaths, and its entablature is supported by capitals resembling those of the antæ at Eleusis; at Antipheilus, antæ carry a triglyphed entablature. ATTICURGE.

In Greek work the height of the entablature varies from one-third to one-fourth of the whole order. The architrave is always a plain face, except in the case of that sculptured with animals and monsters at Assos; but in Roman work a double fascia was seen at Albano, and at the baths of Diocletian at Rome. The band for the guttæ is not cut at Assos; while at Kangovar a range of dentils is introduced in the place due to those ornaments. The temple to Ceres at Pæstum has a corona to the architrave; and this edifice is also recognised by the absence of triglyphs from the frieze, and by the caissoned soffit of its cornice. It seems evident from the peculiar expression used by VITRUVIUS, iv, 3, that the Doric order was in little favour at Rome for sacred buildings; he notices the Greek rule of having a triglyph at the angle of the building, and prescribes a semi-metope in that place. A Doric entablature used over Ionic columns is seen at the tomb of Theron at Agrigentum, and over Corinthian columns at the triumphal arch at Aosta, as well as dentils over the frieze in the theatre of Marcellus, where they support the mutules; a sort of cut dentil-band also occurs, but without mutules, at the baths of Diocletian. The GUTTÆ and the mutules are noticed by VITRUVIUS, iv, as guides by analogy, like dentils, for a Corinthian entablature. A temple at Selinuntum has the mutules over the metopes narrower than those over the triglyphs. Sufficient attention does not seem to have been hitherto paid to the highly enriched cornice of the scene to the theatre at Segeste; to the remarkable exaggeration of the members over the corona in some of the Sicilian edifices, particularly at the temple to Hercules at Agrigentum; or to the observation of VITRUVIUS that the coronas, simas, and tympanums are to be executed similarly to those described by him for Ionic buildings.

The discovery in 1839 of the remains of the Tabularium at Rome was remarkable as affording a rare, if not unique, instance of the imitation of Greek art in that city under the Republic. The example furnished by the theatre of Marcellus at Rome may suffice as a type of the difference between Roman and Greek Doric. The near ratio above named of width to length in every face is exchanged for another so distant that it reduces the massive and solid character to one which is to a certain extent more decorative: thus the entablature is a fifth

of the whole height of the order; the cornice is enlarged and enriched with dentils; the height of the architrave is lessened; and, while the column is lengthened to eight diameters in height, its flutes are omitted, its abacus has a cymatium, the ovolo is exchanged for a quarter round, and the groove for an astragal. The drift of the argument in several pages of PARNOT, *Essay on the Principles of Design in Architecture*, prefixed to CHAMBERS, *Decorative Part*, etc., fol., London, 1826, is perhaps condensed in the following words: "in considering the profiles of the Greek and Roman Doric order, there seems to be a distinguishing characteristic in each, arising from a difference of proportion in the adjustment of the diagonal lines and consequently of the middle tints as relates to the shadows; in the former the diagonal forms being comparatively small, and in the latter often of quantities surpassing the horizontal and vertical lines connected by them: the effect produced by this arrangement alone, enables the connoisseur, even at a great distance, to declare the order of the building."

The chief works which afford illustrations of this subject are those published by the SOCIETY OF DILETTANTI; FALKNER, *Museum of Classical Antiquities*, 8vo, London, 1851, i, 87; TEXIER, *Asie Mineure*, fol., Paris, 1839, and *Arménie*, fol., Paris, 1842; PIETRASANTA (Serradifalco), *Le Antichità della Sicilia*, fol., Palermo, 1834; and the books which have supplied materials to ATKIN, *Essay*, fol., London, 1810; to MAUCH, *Neus System. Darstellung*, 4to, Potsdam, 1845; and to NORMAND, *Parallel*, fol., London, 1829: these last named productions, exhibiting the profiles of the chief ancient and modern varieties, unfortunately do not always specify the sources from which they have been drawn, except in the case of the designs made by the early Italian architects; to which the compilation by Sir W. CHAMBERS should in future be added. It must be recollected that these modern artists had only Roman examples by which to elucidate the text of VITRUVIUS. The sculptor-architects of the Renaissance period felt at liberty to deviate from the Roman remains and from their teachers; and the natural result was the imitation, and indeed modification, to such an extent that the variation can sometimes hardly be referred to the original.

DORKING LIME. A lime used to a very great extent in the metropolis, and in the south-eastern counties of England. It is obtained from the lower beds of the chalk formation (the *chalk marl* of the early geologists) near the town of Dorking in Surrey. The best varieties contain about 8 per cent. of silicate of alumina, the rest of the material being a pure carbonate of lime. At Dorking, the mode of burning usually adopted is by what are called "running kilns," and the lime is said to be "flare-burnt"; though it is important to observe that the mode of burning has far less influence upon the quality of the lime obtained, than is usually believed to be the case. The best Dorking lime has a light buff colour; it is slightly conchoidal in its fracture, and is moderately hydraulic. Naturally, under these circumstances, the Dorking lime swells a great deal in slacking, though by no means to the same extent as the ordinary chalk lime does.

G. R. B.

The Godstone, Halling, and Mersham limes are obtained from precisely the same bed as that of Dorking, and are of precisely the same quality.

PASLEY, *Limes*, etc., 8vo, London, 1838, sec. 25, considers that the London practice of putting more sand to the Dorking and Halling limes than is allowed to common chalk lime, is erroneous, as these two limes are in an intermediate state between pure lime, which is the weakest, and the water cements, which are the strongest, of all calcareous cements; and that the proportion of sand, which will make good mortar with chalk lime, would entirely ruin cement, which is scarcely capable of bearing one-third of that quantity: he recommends three cubic feet of sand to one of Dorking or of Halling lime to make good mortar. The water required will be nearly one cubic foot, and the quantity of mortar produced will be about

two and nine-tenths cubic feet, being rather less than the original space occupied by the sand alone.

**DORMAN, DORMANT, DORMAWNTE TRE.** This, called in Norfolk **DORMER**, according to FORBY, *Vocabulary*, 12mo., London, 1830, a great beam (Fr. *treine*), according to CORGRAVE, *Dict.*, fol., London, 1650, is explained by the SURTEES SOCIETY, *Finchale Priory*, 8vo., Newcastle, 1837, p. 426, as a large beam, in the roof of a house, upon which portions of the other timbers rest or sleep.

**DORMER** or **DORMER WINDOW**, called in Leeds 'cripple window', and in the south-western districts of Scotland 'storm window' (Fr. *lucarne*). A window (and in modern houses very frequently a door) pierced through a roof, and generally in old buildings placed in a small gabled wall either rising flush with the face of the wall below, or else corbelled out. According to the GLOSSARY, s. v., "there do not appear to be any dormers now existing of an earlier date than the middle of the fourteenth century" in England, but there are earlier examples on the continent.

**DORMITORY**, also called **DORTOR** and **DORTOURE** (It. and Sp. *dormitorio*; Fr. *dormitoire, dortoir*; Ger. *schlafgemach*). The name given in some monasteries and similar establishments to the sleeping apartment that received the larger number of the inmates: WILLIAM OF MALMESBURY, *De Gestis Pontif. Angl.*, 28, shows that the use of such an apartment by secular canons in England was ordered 1050 by Leofric the first bishop of Exeter, 'contra morem Anglorum, ad formam Lutheranicorum.' The name is at present adopted in this country, for such a room, in a building for educational or charitable purposes. In the mediæval monasteries that were not CARTHUSIAN, the dormitory was usually on the first floor. "The one at Canterbury cathedral was on the east side of the cloisters in a continuous line from the chapter house, a place very unusual, and a departure from the general rule. On the west side of the cloister the monks' dormitory was usually placed, and beneath this was a passage or entrance forming a communication between the cloister and the court. At Fountains abbey, Yorkshire, a spacious groined ambulatory, divided down the centre by a row of piers, formed the substructure which still exists, though the dormitory itself is destroyed. Similar remains exist at Kirkstall abbey; and at the Whitefriars at Coventry both still exist, the dormitory being divided into wards for the inmates of the workhouse adjoining it. At the north end of the dormitory was a flight of steps, by means of which ready access was made to the church, either through the cloister, or, as at Fountains abbey and Worcester cathedral, immediately into the church. In the ancient rites and monuments of the monastical church at Durham, it is stated that "on the west side of the cloister there was a large house called the *dorter*, where the monks and novices lay, every monk having a little chamber of wainscot, very close to himself, and their windows towards the cloister, every chamber a window, by reason the partition betwixt every chamber was close wainscoted, and in every of these chambers was a desk for their books." ASSOCIATED SOCIETIES, *Papers*, etc., 1850-1, p. 179-184. At Worcester cathedral "the dormitory being a very large room reaching down from the west cloister towards Severn, was divided into as many partitions or cells, as there were monks, so as every one had his several lodging:" ABINGTON'S MSS., fol. 75, quoted in WILD, *Worcester Cathedral*, fol., London, 1823, p. 17. The dimensions were frequently, of course, considerable; thus the dormitory at Durham, built soon after 1398 and restored 1850, was originally 193 ft. 6 ins. long, 39 ft. wide, and 31 ft. high; that at Fontenelle, said to have been erected in the eighth century, was 208 ft. long, 27 ft. wide, and 64 ft. high; while that to the suppressed monastery of Olivetines called S. Michele in Bosco, near Bologna, is 427 ft. (MURRAY, *Handbook*) in length.

BLOMEFIELD, *History of Norfolk*, fol., London, 1805-10, ii, 520, says that at Wymondham abbey the dormitory was

ARCH. PUB. SOC.

over the south aisle of the church, which has been confirmed by discoveries made in some recent alterations, according to the ARCHÆOLOGIA, 1836, xxvi, 290. At S. Germain des Prés and at Maubuisson it was over the chapter house; but it generally covered the common-room; but at Notre Dame de Poissy it occupied the south and west sides of the cloister. It sometimes had on each side a range of cells, as at Higham Ferrers, and at S. Mary's hospital in Chichester.

Height is indispensable in a dormitory; it should in no case be under 10 ft. if made to accommodate only six persons; nor under 12 ft. if intended to lodge twelve persons, the utmost number that should sleep in any one room. In India it is recommended that the rooms should be 30 ft. high; the heat of the country is tremendous, and if the inhabitants have not thick walls and lofty rooms, sickness is inevitable. The space allowed per person should not be less than 800 cubic feet, giving equal consideration to the distance of the beds apart, as to the height; 600 ft. is recommended by the Army Commissioners for barracks, and 1200 ft. for hospitals. It should always be remembered that 1000 ft. is considered necessary for each prisoner in England. The arrangements of the windows and the ventilation are also matters for consideration. On the subject of the space to be allowed to each person in a dormitory, and indeed in any room, reference should be made to GUY, *Lecture on the Sanitary Condition of the English Army*, 8vo., London, 1858, which shows that 20 cubic ft. was the quantity in the black-hole at Calcutta, and that the difference between the rates of consumption and catarrh in spaces between 500 and 600 cubic feet, as compared with those in spaces exceeding the latter quantity, were as 4.35 and 3.48 to 4 and 2 per cent.

**DORNOCH.** This, which is a royal burgh in the county of Sutherland in Scotland, was the seat of the extinct bishopric of Caithness. The parish church occupies a restored portion of the old cathedral, which is supposed to have been erected under Gilbert Murray (S. Gilbert), consecrated bishop 1222. A Free church in a Pointed style, and the county gaol, are the only other public buildings. 50.

**DORON** (Gr. *δωρον*). The term for a palm of four digits (nearly 3 ins.), from which were derived the names for the three sorts of bricks used by the Greeks. BRICK (History of), p. 137.

**DOROTTE** (JEAN LOUIS), born 1757 at Paris, studied under Poulin and Perlin, passed into the employment of the government, became under the Convention inspector of public works, and afterwards architecte commissaire of the department of the Seine. His best work is the château at d'Aligre, near Paris. 68.

**DORSMAN** ( . . . ) of Amsterdam erected 1668 the new Lutheran church in that city. His portrait is engraved in mezzotinto. 24.

**DORTOR** or **DORTOURE**, see **DORMITORY**.

**DOS D'ANE.** A French term equivalent to **SADDLEBACK**, and usually applied in England to the coped grave stones, generally attributed to the thirteenth century.

**DOSER**, see **DOSSEL**.

**DOSI** (GIROLAMO), born at Carpi about 1695, studied at Rome under Carlo Fontana, and became architect under Clement XII. Among his works are to be enumerated the villa Cibo near Rome; the lazaretto at Ancona; the orto botanico at Rome; the fortress at Civita Castellana; and the cathedrals at Albano and at Velletri; besides long and difficult repairs to the church of Sta. Maria Maggiore at Rome. He returned 1768 to Carpi, where he died 23 November 1775. 93.

**DOSIO** (GIOVANNI ANTONIO), born 1583 at Florence, studied from 1548 at Rome as a goldsmith, a sculptor, and an architect. He erected several small works there and in his native city; in the latter he directed (the façade at least of) the palazzo del Giacomini in the strada de' Tornabuoni, illustrated by RUGGIERI, *Scelta*, fol., Florence, 1755, i, 47-51, and by FAMIN and GRANDJEAN, *Architecture Toscane*, fol., Paris, 1846, pl. 45; the additions to the archiepiscopal residence, amongst which was perhaps the cortile illustrated by FAMIN,



pl. 25; and the capella Niccolini or della Croce, now de' Gaddi, in the cathedral. He also made in competition with B. Buontalenti about 1588-90, one of the many designs which have been submitted for the front of the cathedral. G. Caccini was one of his pupils. 3. 68.

DOSSEL, DOSSER, DOCKER, DOSER, DOSUR (in late Latin *dorsale*). The Fr. *dossier* is applied by GUENEAULT, *Diet. Icon. s. v.*, to a settle, a stall, or any other seat with a back to it; and this French term seems to intimate the 'back or leaning board of a stall; therefore, although the 'docker of a hall' is explained in the PROMPTORIUM PARVULORUM by 'dorsorium, aulæum', a hanging, it seems rather to mean the high wainscoting or panelling in apartments. REREDOS.

DOTI or DOTTI (CARLO FRANCESCO, generally called FRANCESCO only), born 1670, rebuilt at Bologna the church of Sta. Maria delle Muratelle, 'soon after 1680'; and remodelled 1747 by R. Compagnini; great part of the church of S. Giacomo de' Carbonesi; the church of S. Domenico, with the first atrio and its small but elegant cortile, as well as the second atrio of the attached monastery, 1730; the celebrated church of the Madonna di S. Luca sul Monte della Guardia, 1731; and the palazzo Agucchi Giavarina, 1740. He modernized the *corò* to the church of S. Procolo; enlarged and decorated the cappella maggiore in the church of Sta. Maria Maggiore, for pope Benedict XIV, 1740-58, about which period he also erected the library added to the university; he designed the majestic cloister of the church of S. Giovanni Battista de' Celestini; the altar of the cappella Foscherari in the cathedral church of S. Petronio; the church of S. Sigismondo, which has been restored by G. Jarmorini (the campanile is later and the work of A. Venturoli); the interior of the palazzo Monti, now Caprara (the exterior being by A. Torregiani); and executed with alterations the design of F. Bibiena for the arco del Meloncello. He was a member of the Accademia Clementina, was elected architect to the senate 11 December 1731, and died 1759, aged 89; according to the additions to MILIZIA, *Memorie*, 8vo., Bologna, 1826, iv, 483, which show that F. Tadolini had been his pupil. The same author, *s. n.* Vanvitelli, shows that this must be the Dotti who was one of the eleven competitors that submitted the twenty-two designs for the façade of the church of S. Giovanni Laterano in Rome, which are preserved in the Accademia di S. Luca.

He is not to be mistaken for a mason, Francesco Dotti, engaged 1647 on the works at S. Petronio; nor, as is usual, with the subject of the following article. 94. 105.

DOTTI (GIOVANNI GIACOMO), son of Carlo Francesco, designed 1768 the *porticato* to the church of S. Girolamo in the Certosa, now the cemetery, at Bologna; and 1770 the porta di strada Maggiore, engraved in LANDI, *Palazzi*, fol., Bologna, n.d. He was elected architect to the senate 22 December 1759, and died 1780. 105.

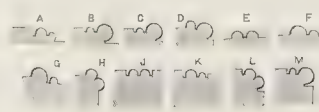
DOTTO (IL CONTE VINCENZO), a native of Padua, designed 1607 the staircase (which was long attributed to Palladio) in the palazzo del Capitano in that city; and also the plan of the adjoining Monte di Pietà. 3. 68.

DOTZINGER (JOBST, JODOCUS, or JOST), of Worms, was engaged 1452-72, after the death of Johann Hülz, as werkmeister to the cathedral at Strasburg, where he made the font (*battisterium, taufstein*) 1453, and repaired the choir 1455-60, and the vaulting under the new-leaded roofs 1459-69. He is remarkable for having had sufficient influence to cause 1452 that confederacy among the *hütten* or masons' associations in Germany which produced the compilation of statutes of fraternity at Ratisbon 1459, and brought about the acceptance of the werkmeister at Strasburg cathedral as the grand-master (*gross-meister*) ex officio, a predominance which lasted until 1707, when Strasburg became subject to French authority. STIEGLITZ, *Von Altleutscher Baukunst*, 4to., Leipzig, 1820, p. 182; DE CAUMONT, *Cours*, 8vo., Paris, 1831, iv, 303; FIORILLO, *Geschichte*, 8vo., Hannover, 1815, i, 358. 68. 92.

DOUBIKIN, see DOWBIGGIN (LAUNCELOT).

DOUBLE ARCH. A term used in RICKMAN, *Attempt*, 8vo., London, 1848, p. 62, apparently for that sort of arch which in a few instances seems to have been erected in Norman times from two centres, the radii being shorter than half the span of the arch. DEPRESSED ARCH.

DOUBLE BEAD. The general name for two beads, placed side by side, one of which is frequently narrower than the other, as in the accompanying illustration, where the beads are mostly shown as quirked, although in work executed before



the revival of Greek art in England the quirk was often omitted. Double beads, cock and flush, are shown at

A, B, C, and D; double cock beads at E, F, G, and H; and double flush beads at J, K, L, and M. BEAD.

DOUBLE CLOISTER. The term given to a building used as a cloister, and which is divided into two parallel walks by columns or piers, as at Fountains abbey. A. A.

DOUBLE CURRENT VENTILATOR, see DIAPHRAGM.

DOUBLE DEAL. An old name for deals two inches in thickness; as 'whole deal' was the term for 1½ stuff. A. A.

DOUBLE FASCIA ARCHITRAVE. An ARCHITRAVE with two fascias, as at A, B, and C. In joiners' work the fascias and moldings are glued



up or rebated; and, if wide, they should be keyed and buttoned. The upper fascia is called the header or heading architrave, and the lower the jack architrave.

DOUBLE FEATHERING. The feathering, foil, or lobe between two cusps in the details of Pointed architecture, is sometimes itself ornamented with sub-featherings or foliation, and the work is then said to be double feathered. RICKMAN, *Attempt*, 8vo., London, 1848, p. 52.

DOUBLE FLOOR. A floor consisting of three horizontal ranges of timbers; thus the boards are laid on flooring or bridging joists which are carried by binding joists, to the underside of which the ceiling joists are spiked up.

DOUBLE FRAMED FLOOR. A DOUBLE FLOOR that has its binding joists framed into girders instead of reaching from wall to wall, with bridging joists for the floor, and ceiling joists beneath. A very desirable arrangement where the transmission of sound is to be prevented as much as possible. BINDING JOIST. J. M. L.

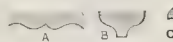
DOUBLE GARRON NAIL. This term is explained as a spike, about six inches long, used in rough framing as in a roof, by LONDON, *Encyc. Cottage, etc., Architecture*, 8vo., London, 1842, § 1066.

DOUBLE HUNG. The term used to signify that both sashes (when there are two) to a window are hung with pulleys, lines, and weights. Until within the last century it was usual, as at present in too many new houses, to have the sashes single hung; so that the lower sash only could be moved, although the frame was prepared so that both could be hung. 1.

DOUBLE INTERSECTING TRIANGLE, used in mediæval decorations, see PENTALPHA.

DOUBLE MONASTERY. In some such rare cases as those of the BRIDGETINE BUILDINGS, two conventual establishments, a monastery and a nunnery, were separated only by a church common to both; and the whole group of buildings has been generally, though not very properly, called a double monastery. MONASTIC BUILDINGS.

DOUBLE RESSANT or RESSAUNT. This mediæval term is appropriated by WILLIS, *Arch. Nom.*, 4to., Cambridge, 1846, p. 9, to the molding indicated at A; a 'double ressaunt with a fylet' being supposed by him to be represented by B, and a 'ressant lorymer' by C.



**DOUBLE VAULT.** The collective name given to two vaults of brick or stone carried up with a small space between them. These are sometimes connected by ribs, as in the dome of S. Peter's at Rome, of Sta. Maria del Fiore at Florence, and of Sta. Maria di Loreto at Rome; it is doubtful, however, whether this last be not wholly or partially of timber. 1.

**DOUBLES.** One of the names used for stone prepared for some special purpose, found throughout the Ely Sacrist rolls, according to WILLIS, *Arch. Nomenclature*, 4to., Cambridge, 1846, p. 25.

**DOUBLES.** The name given to one of the smallest roofing slates, the size being 13 ins. by 6 ins. A thousand will cover about two squares, and weigh about three-quarters of a ton.

**DOUBLING.** A term used in Scotland for EAVES BOARDS. 1.

**DOUCET (JACQUES)** finished 1726 the church of S. Louis, in the Isle Notre-Dame at Paris, commenced 1644 by Leveau, and partly completed by Leduc. **BLONDEL**, *Arch. Franc.*, fol., Paris, 1771, ii, 126.

**DOUCHAIN ( . . . )**, who was architect of the department at Versailles, designed 1835 the abattoir there, given in *NORMAND, Paris Moderne*, 4to., Liège, 1834-41, i, pl. 84-7. He died shortly before June 1845.

**DOUCINE.** The French name, adopted in several early English books on architecture, for the cima or CYMA-RECTA.

**DOUHA (HENRI)**, born at Anset-Glams near Liège, established himself at Verviers, and designed 1781 the château at Jansenville near Spa, given in *GOETGHEBUER, Choix*, etc., fol., Ghent, 1827, p. 58, who notices that the portico and bay windows were added 1810 by Vivroux.

**DOULTING STONE.** The quarries from which this stone is obtained belong to the inferior oolite, and are situated south of the Mendip hills, and about two miles east of Shepton Mallet, Somersetshire. The Doulling beds are on the same geological horizon as the inferior oolite beds of Hamdon hill, near Yeovil. A section at Mr. Vinnell's quarry, in descending order, shows the following beds:—

1. Rubble	-	-	-	-	5	0
2. Thin courses	-	-	-	-	2	6
3. Stone	-	-	-	-	1	0
4. Ditto	-	-	-	-	1	0
5. Freestone—the upper bed worked	-	-	-	-	5	0
6. Raggy bed—waste, containing numerous casts of shells	-	-	-	-	2	0
7. Freestone	-	-	-	-	6	0
8. Ditto, very good, but the coarsest grain	-	-	-	-	3	0
9. Waste bed, only suited for rough work	-	-	-	-	2	0
10. Freestone, bottom bed, very good, but of coarse grain	-	-	-	-	4	0

The beds 9 and 10 are only worked in the above quarry. All the quarries are much fissured, and there is considerable false bedding, owing to which the stone varies much in thickness in the same beds over a small area, and the same beds alter in texture in different quarries. The coarser grained stone stands the weather equally well with the fine, but is more difficult to work.

Blocks can occasionally be obtained from 20 to 30 ft. in length; and twenty-three tons of stone have been raised in a single block. From the homogeneous character of the stone it is very durable, and is therefore a very valuable building material. The cathedral at Wells is built of stone from these quarries.


The railway lately opened to Shepton Mallet has made a section completely through these oolites, and will afford greater facilities than heretofore for their transportation to a distance. The Doulling cutting shows that below the bed No. 10 there are beds of bastard oolite 30 ft. in thickness passing into the upper lias. (Charles Moore, esq., F.G.S., Bath.)

**DOUX (C. N. LE)**, and **DOUX (L. LE)**, see **LEDOUX**.

**DOVE COTE**, see **PIGEON-HOUSE**.

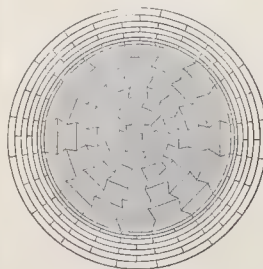
**DOVE MARBLE.** A marble, which as its name implies, is of a dove colour delicately marked with white blotches; the texture is close and fine. Another dove marble is obtained from the quarries at Carrara, in the duchy of Modena, where

it is termed Palombino; a milk white, very fine cement, resembling creamy milk or ivory, without transparency. It is supposed to be the Coralitic marble of the ancients, and to have resembled the Grechetto.

**DOVETAIL**, formerly called **CULVER TAIL** (Fr. *queue d'hirondelle*, *swallow's tail*). A mode, used by masons, carpenters, joiners, and some others, of fastening two pieces of material together by letting the end of one, fashioned in the form of the expanded tail of a pigeon, into a hole formed in the other. In masonry a dovetail joint is now rarely used, compared with its employment for several ages previous to the seventeenth century: but wherever cramps are required upon a surface, the best form is that of a double dovetail key,  which may be seen in wood in most collections of Egyptian remains. The dovetail, whether single or double, has generally been considered the strongest and safest method of making a joint, because the tongue of the tenon is wider than the cavity through which it must pass in drawing away from its place. But in carpentry it has not been much employed of late years, because, in the case of a beam dovetailed to a plate where the under side of the beam is cut as at A, and the upper side of its plate as at B, the shrinking of the timber in the first named

piece allows the tenon, unless its slope be considerable, to draw to a certain extent away from the plate. So also in joinery, as drawers, etc., a careless or inconsiderate application of material may frustrate the intention of dovetailing if the shrinkage be not allowed for: it is necessary to take care that the two pieces which are to meet should have the grain following as at C C, so that they may expand or contract equally, if equally wet or dry; and to ensure this condition the pieces are generally cut from the same plank for small work; when the grains cross, the piece having its fibres cut to receive the dovetails would by its restraint probably cause the other piece to split or cast. Trenails, double dovetailed, as D, have been recommended by **BLACK**, *Some Account of the proposed Mode of Combining Timber*, 8vo., London, 1797, especially for insertion at an angle of thirty-seven degrees with the fibres of the wood, for making a very strong connection between planks of three or four inches in thickness.

Perhaps no more notable examples of the application of the principle of dovetailing can be pointed out than those exhibited in the construction of the Eddystone and Bell-rock lighthouses; the former, erected 1757-9, by Smeaton, and the latter, 1807-10, by Stevenson. The method of uniting in one the stones in each course of masonry in the lower and solid portion of these structures, appears in the accompanying figure; the courses were prevented from sliding on each other by plugs projecting up and down from each bed. The upper portions of



the structures, being hollow, were bonded together by modifications of these methods.

I. W.

The term 'dovetailed' is to be recognized in the 'dustalled' of documents of the seventeenth century, as in **JURP**, *Hist. of Carpenter's Company*, 8vo., London, 1848, p. 296. **COCKING**.

Dovetailing is now usually part of the duty of any grooving, slotting, and rebating machine. Dovetailing is either exposed or concealed, the latter being of two sorts, viz. either lapped or mitred; a **DOVETAIL-NOTCH** is of two kinds, common and undercut. A **DOVETAIL-SAW** for the purpose of cutting the timbers is usually made about 9 ins. long, with fifteen teeth to the inch, and has a brass or iron back to the blade for stiffness.



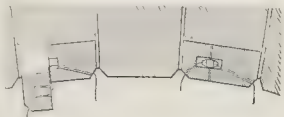
**DOVETAIL FRET or MOLDING.** This enrichment, which is used chiefly in works of Romanesque character, takes its name from the shape of the running ornament employed, which consists of a molding taking in its progress the form of a dovetail; the alternate dovetails being inverted, and having one side common to both, as at B in the illustration given *s.v.* **CHEVRON.**

**DOWBIGGIN**, sometimes written **DOUBIKIN** (**LAUNCELOT**), superintended the erection, from his own design, of the church of S. Mary, Islington, in the north part of London. The first stone was laid 28 August 1751; the edifice was opened 26 May 1754, and underwent considerable repairs in 1787. Good views are given in **NELSON**, *Hist., etc., of Islington*, 4to., London, 1811, p. 308; and in **LEWIS**, *Hist., etc.*, 4to., London, 1843, p. 210; the building cost £6,319, the clock, bells, organ, and superintendence, etc., make a total cost of £7,340; of which Dowbiggin received £105 for his assistance, and £18 18s. for special services. A design for a bridge at Blackfriars, by himself and his son, is given in the **LONDON MAGAZINE**, 8vo., London, 1756, xxv, 160. He died 24 July 1759, aged 70.

**DOWEL** (from the Fr. *douille*, a socket), the name given originally to a pin used horizontally for joining two pieces of material, the dowel being inserted into its socket in the one substance before the other substance with the other socket is forced into place. This process, when applied at the edges of floor boards, gave them the name of dowelled floors; but the pins have been superseded by a continuous dowel, or tongue, of hoop iron. A vertical **CRAMP** is often called a dowel, though it is properly a **PLUG**: the term dowel is also sometimes applied in masonry to the material with which the female joggles in vertical joints is filled; and to the upright plug fixed in the centre of each drum of a column. At Baalbec, the plugs and cramps are said to be of olive wood.

"Great ingenuity was displayed by Messrs. Walker and Burges, 1833-4, in the method of restoring the defective arch stones in the restorations of Blackfriars bridge, consequent on their sloping sides. The decayed portions were cut out to a depth of fifteen inches. After the old work has been properly prepared, the space is filled up with two stones or thicknesses instead of one. The first laid, called the lower one, is thicker at the back than at the front by rather more than the difference of the heights of the front and back part of the whole course of which it is a part. The other stone will then require to be thinner behind than before. In the centre of the bed of this upper stone a hole is bored, into which, previous to its being driven, is put a circular stone plug tapering from the middle towards each end; to this plug a cord is attached which passes through a hole drilled from the chamfer outside to the upper part of the large hole, where it is fastened to the top of the stone plug. By this means the plug is kept steady during the operation of driving. When the upper stone has been driven into its place, the cord is loosened, and the plug falls half its length into a hole, which has been made to receive it, in the lower stone.

"When a part of the key-course or adjoining courses is required to be replaced, as the plug which connects the two thicknesses lies horizontally, and cannot fall into its place, a small hole is bored from the chamfer to the back of the large hole in the thickest stone, through which a cord is passed which is fastened to the other end of the plug. A small groove is made in the beds of stone to protect the string while the wedge stone is driven home, which being done, it is only necessary to loose one cord and pull the other, and the plug is immediately brought into the hole in the other stone. By this means the two stones are so connected that is impossible for one to come out without the other. Soft



mortar is then forced through the hole so as to fill up the whole of the space round about the plug, which being thus embedded, it is impossible for it to move.

"To ascertain if the plug is in its proper place, a piece of iron with a joint is passed into the hole bored from the upper chamfer, which if it enters the hole, proves that the plug is in its proper place. If the plug cannot be got in, which rarely happens, the upper piece of stone has to be cut out again." Article, Blackfriars Bridge, in the **PENNY CYCLOPEDIA**.

**DOWL AXE.** A tool used in the cleavage of wood for laths. 4.

**DOWN DRAUGHT**, see **DRAUGHT**.

**DOWNING** (**ANDREW JACKSON**), born at Newburgh on the Hudson, near New York, 30 October 1815, followed his father's business of a nurseryman until about 1846, when he abandoned it for the practice of landscape gardening and rural architecture. He wrote, when only twenty-six years of age, *The Theory and Practice of Landscape Gardening, etc., with Remarks on Rural Architecture adapted to North America*, 8vo., New York and London, 1841; 4th edit. 1849. Then *Cottage Residences, their Gardens and Grounds, adapted to North America*, 8vo., New York and London, 1842; new edit. 1853; *Hints to Persons about Building*, about 1849; and *The Architecture of Country Houses, etc., with Remarks on Interiors, Furniture, and the best modes of Warming and Ventilating*, 8vo., New York, 1850 and 1852. His *Fruit and Fruit-trees of America*, 12mo. and 8vo., New York, 1845, reached thirteen editions; and he edited the *Horticulturist*, monthly journal, commenced in 1846; with other floral publications. At the time of his death "he not only had contracts for important professional services in Newburgh, Newport, Georgetown, Albany, Boston, and other places, but was on his way to Washington, being engaged for the national government in the laying out and adornment of the public grounds" (including the Smithsonian grounds and the whole of the public park proposed to connect the president's house with the capitol) "in that city. The last effort of his pen was a postscript to a set of working plans to illustrate a design for an observatory proposed to be erected in one of our principal cities"; *Eulogy*, in the *HORTICULTURIST Journal*, 8vo., Albany, 1852, vii, 491-500, in which a portrait of him is given; and in iii, new series, 21, is a plan and description of his residence at Newburgh; given also in **VAUX**, *Villas and Cottages*, 8vo., New York, 1857, preface. In this work there are many designs by Downing, who visiting England in 1850, made arrangements with Mr. Calvert Vaux to accompany him to New York, and entered into partnership with him the year following. His death was caused in the destruction of the 'Henry Clay' steamer by fire, 28 July 1852, while on his way to superintend the house then erecting for Mr. Daniel Parish, at Newport, Rhode island (given by **VAUX**, p. 307). He was buried at Newburgh.

**DOYA** (**SEBASTIAN**), see **NOY** (**SEBASTIAN VAN**).

**DOYAC** (**JEAN**), see **GIOCONDO** (**FRA GIOVANNI**).

**DRAB COLOUR.** A colour produced by the mixture of white, Venetian red, burnt umber, with a little black, in relative quantities according to the tint desired.

**DRACHSTAEDT** (**CARL**) was employed 1493 on the still unfinished tower of the Moritzkirche at Halle, on the Saale, in Saxony. 92.

**DRAFT**, see **DRAUGHT**.

**DRAG.** The term used to express that one thing rubs upon, or bears upon, another piece of work when contact is not intended: thus a door is said to 'drag' when the lower edge rubs upon the floor in consequence of its drooping from any fault in the hinges, or from a settlement in a partition to which it is hung. 1.

**DRAG.** A thin plate of steel indented on the edge like a saw, used to finish the dressing of any soft stone which has no grit.

**DRAGGING** or **DRAGON BEAM, PIECE, or TIE**, also called **DIAGONAL TIE**. The derivation of this term is obscure, and a clear distinction between the angle tie and the dragging tie or dragon tie is wanting in books upon construction. **WREN**, *Parentalia*, fol., London, 1750, p. 336, speaks of 'two dragon (perhaps rather trigon) beams or braces lying under the joists', in the illustration there given of the theatre at Oxford: and **NEVE**, *Dict.*, 8vo., London, 1703, s. v., with all his copyists to the present time, explain dragon-beams as two strong braces or struts that stand under a breastmer meeting in an angle upon the shoulder of the king-piece. It is properly the name for a beam bisecting the angle formed by the junction of any two plates; so that this and the angle tie are at right angles to each other. The chief use of this arrangement is at the junction of wall plates, where the dragging tie receives the foot or heel of the hip rafter. In the cut, *A* is properly the **ANGLE BRACE**, or rather **ANGLE TIE**, and *B* the dragging beam or tie; *C* being the wall plate. This application of the term may be supported by the authority of **RICHARDS**, *First Book*, etc., 10th edit., 4to., London, 1724 (3rd edit., 1676), giving **Pope's** roofs, p. 230, who shows in his 'Italian or hip roof', the 'dragon beam for the hip to stand on', and 'beam or summer, wherein the dragon beams are framed'; **LANGLEY**, *Ancient Masonry*, etc., fol., London, 1736, p. 360, pl. 375, illustrates the same method, but says only 'secure its angles in the manner represented.'



**DRAIN.** A channel, on or below the surface of the ground, by means of which water is conveyed to the principal discharging course of any district. According to the nature of the water so to be removed, a drain may be open or covered, permeable or impermeable; and according to the importance which the parts bear respectively to the whole system into which they enter, they are called *subsidiary, main, or arterial* drains. When used exclusively for the removal of the waste water of towns, main and arterial drains have of late years been very incorrectly called *sewers*, the conduits for the relief of separate premises being termed *drains*.

The principles to be observed in laying out a system of drainage, whether for town or country, must be, in the main, founded upon the laws of hydrodynamics, and upon the supposition that under no circumstances whatever should the top of the drains be under charge. The water must, in fact, run as in open channels, not as in pipes; and such inclinations must be given as shall effectually guard against any deposition of the matters which may be in suspension in the waters. For subsoil drainage in agricultural districts, it is desirable that the upper part of the subsidiary drains especially should be permeable; whereas for town drainage, the impermeability of the drains and sewers is almost always imperative. The dimensions of the former must be calculated so as to allow of their carrying off the rainfall, and any springs which may be set free; whilst the dimensions of the latter must be sufficient to carry off the surface and house waters of the district. Very great mischief has been effected of late years by the promulgation of some false doctrines upon the subject of drainage, as for instance, by attempting to throw doubt upon the correctness of the formulæ propounded by **DUBUAT** for calculating the velocities and discharges of pipes, which formulæ have been verified and adopted by all competent observers; by urging the use of extremely small drains; and by endeavouring to create a prejudice in favour of a particular material for the purpose, by applying the name of *self-cleansing pipes* exclusively to the glazed stoneware goods which have lately been used to such an extent for drainage purposes, besides other technical and theoretical mistakes in the *Minutes of Information collected with reference to Works for Drainage*, or of the other publications by the late **GENERAL BOARD OF HEALTH**; but the reader who would desire to learn the facts of the case may refer to the numerous discussions which have taken place on the subject at the **INSTRU-**

**TUTION OF CIVIL ENGINEERS**, or to **NEVILLE**, *Hydraulic Tables*, 8vo., London, 1853. The other works it would be desirable to consult upon the laws of hydrodynamics as applied to drainage, are **ROBISON**, *System of Mech. Philosophy*, 8vo., Edinburgh, 1822; **BEARDMORE**, *Hydraulic and Tide Tables*, 8vo., London, 1852; **DOWNING**, *Practical Hydraulics*, 8vo., London, 1855; **D'AUBUSSON**, *Traité d'Hydraulique*, 8vo., Paris, 1840; **CLAUDEL**, *Formules à l'usage des Ingénieurs*, 8vo., Paris, 1854; **AIDE MÉMOIRE**, etc., 8vo., London, 1845; *Reports of the Commissioners for Inquiring into the State of Large Towns and Populous Districts*, 1844, etc.; **DEMPSEY**, *Drainage of Towns and Buildings* (Weale), 12mo., 1849; **HOSKING**, *Regulations for Buildings*, etc., 8vo., 1849; **ADCOCK**, *Engineers' Pocket Book* for 1858.

It may be desirable to add that the velocity necessary to be maintained in the waters flowing in a drain must be at least 3 ft., and would be better 4½ ft. per second. The inclination of the drains themselves, to secure this condition, will of course depend upon their length and the mean depth of the waters flowing in them; but practically it is found that house pipe drains ought never to be of a less diameter than 6 ins., and that a fall of 1 in 80 should at least be given to them. A rather less inclination may be given to cast iron than to stoneware pipes; but brick drains exercise so marked an influence in retarding the rate of flow that they require to have greater inclination than either of those kinds of pipes. On this subject of the friction of water in the various descriptions of pipes, consult **DARCY**, *Recherches expérimentales relatives au mouvement de l'eau dans les Tuyaux*, 4to., Paris, 1857.

G. R. B.

**BOULNOIS**, in paper read at the Royal Institute of British Architects in 1854, p. 87, 99, and 123, stated that the simplest division of the subject of the removal of refuse from buildings and streets is into drainage, sewerage, and outfall. Drainage has to be considered under the head of *subsoil drainage, surface drainage, and house drainage*. *Damp soils and damp basements* to houses are as constant and as deadly destroyers of human life as all the foul emanations of undrained refuse. *Surface drainage*, the removal of rain water, opens up the question of small or large sewers; while *house drainage* includes the consideration of the best appliances for removing the exuvie and waste waters of its occupiers at once into the sewer provided for this purpose under the public way. On this point arises the question of using back combined drainage, or a separate drain from each house to the sewer. He added that four inch pipes from sinks, and six inch from water closets, are the smallest which practice has warranted for adoption. Theory proves that a three inch pipe with the inclination ordinarily obtainable in London, would be enough to carry off the refuse from a first class house; but practice has discovered such frequent stoppages even of four inch pipes, that they are now scarcely ever used. **BARREL DRAIN; BOX DRAIN; DIVIDICULUM; PIPE; SEWER; SOIL PIPE.**

The nature of the materials employed in the construction of drains modifies their names; and we thus have brick, stone, tile, pipe, and stoneware pipe, drains.

**DRAIN PIPES** (Fr. *tuyaux de drainage; décharge*, overflow drain) are made for agricultural purposes of almost any diameter, from 1 in. to 18 ins., of common clay, though it is rarely that they are used of more than 6 ins. in diameter; for when it is found that the quantity of water to be removed would be so great as to require the use of larger pipes than those mentioned, it is customary to discharge that water into open arterial drains, or into brick channels. In house drainage it is a matter of so much importance to prevent the escape of any mephitic odours, that impermeable stoneware drains (as the drain pipes made of clay susceptible of a species of semivitrification are called) are almost exclusively used. The conditions which, in fact, ought to be united in a house drain are, impermeability, freedom from injury by the dilute acids which always exist in the waste waters of a house, and



from interruption of their flow through the irregularities of the bore of the tubes. But even in the best drains of this description, it is impossible to maintain a clear passage without passing a sufficient quantity of water through the tubes; and consequently the assertion that glazed stoneware drains are self-cleansing is both incorrect and dangerous. It may be added that the glaze upon the London stoneware pipes is produced by volatilizing salt amongst the goods in the kiln; and that this process adds materially to the quality of the articles to which it is applied.

The London stoneware pipes are made principally from the clays of Dorsetshire and Devonshire. Equally good, but more costly, pipes are made from the coarse Kaolin clay found on the borders of the Dartmoor district. Very excellent drain pipes are made from the midland counties, and the northern, fire clays; whilst for many purposes those made from the clays of the subcretaceous formations found near the village of Aylesford in Kent are sufficiently impermeable. Pipe drains of either of these materials are to be obtained in England of any dimensions, which can reasonably be required, even of three feet in diameter. The powers of pipes to resist the internal pressure of water must of course depend upon the resistance of the material used for the joints; but as it is very rarely indeed that a properly planned system of drainage would allow of the separate pipes being exposed to the action of the water running in them full bore, it is not necessary to take this contingency into account. Drain pipes are, however, at times exposed to great efforts of compression, and in order to resist this particular strain it is necessary that the 9 in. pipes, for instance, should be made so as to resist a cross strain acting instantaneously of about 24 cwt.; and that the 12 in. pipes should resist a rather greater effort, say of 25 cwt. The thicknesses required to ensure these resistances will depend on the nature of the clay used in preparing the pipes, and they vary nearly as follows:—

	Diam.	Thick.	Diam.	Thick.	Diam.	Thick.
Stoneware pipes	6"	$\frac{3}{8}$	9"	$\frac{1}{2}$	12"	1
Aylesford pottery	6"	$\frac{1}{4}$	9"	$1\frac{1}{4}$	12"	$1\frac{3}{4}$

KNAPP, *Chemical Technology*, 8vo., London, 1848; SALVETAT, *Leçons de Céramique*, 12mo., 1857; *BUILDER Journal*, 1856, xiv, 329.

G. R. B.

**DRAIN TILE.** In some parts of England land drains are formed entirely of curved tiles, made of ordinary brick earth, and burnt in kilns; generally used in connexion with soles, or flat tiles, which cover the bottom of the drain. The usual dimensions of tiles for main drains are from 4 to 5 ins. in diameter in the clear, and 5 ins. high; the soles are from 9 to 10 ins. in width; and both are made 15 ins. long, and about  $\frac{3}{4}$  in. thick. The introduction of drain pipes has, however, almost destroyed the demand for drain tiles and soles.

G. R. B.

**DRAM, DRAMM, or DRAMMEN.** This term, as applied to timber and battens, is taken from the name of the river Dram in Norway; a bridge over which connects Brageraens with Stromsoe, and at the west end of this town a small bridge joins it to the suburb called Tangen. The two towns and the suburb are generally known by the familiar name of Dram or Drammen, and have a considerable trade in timber and deals (the latter being supplied from numerous saw mills at Egor), as ships can arrive under sail at the bridge, above which the river is navigable for boats only. EDY, *Remarks on Bydell's Scenery*, fol., London, 1820, pl. 71. This term is as old as the time of EVELYN, *Sylva*, fol., London, 1679, p. 102, who says 'that (fir) which knowing workmen call the dram, and that comes to us from Bergen, Swinsound, Moss, Longlound, Dranton, etc., long, streight, clear, and of a yellow more cedrie colour, is esteemed much before the white for flooring and wainscot.' NEVE, *Dict.*, 12mo., London, 1736, says that balks are small fir trees without tops brought from Norway, whence balk timber was sometimes called Dram timber. ABIES; BALK; BALTIC TIMBER; FIR; PINTS.

**DRAMYSSUS.** The name of a village, near Joannina in Albania, which it is suggested occupies the site of the ancient Dodona on account of the extent of the ruined theatre, that may have accommodated more than twenty thousand persons. The remains are illustrated by DONALDSON, pl. 3, in the supplementary volume to STUART and REVETT, *Antiquities of Athens*, fol., London, 1830, p. 46.

**DRAPER** (JOHN LE) and WILLIAM the clerk of Windsor, were 'custodes operationum' at Windsor Castle in the year 1223; POYNTER, *Windsor Castle*, fol., London, 1841, p. 3; from the Clause Roll 7, 8, Henry III: but it is not clear that they had the direction of the works.

**DRAUGHT.** A current of air in or about a building or other enclosed space. The primary cause of draughts appears to be a variation of temperature by which the specific gravity of the air in a given space being altered, a description of vacuum is there produced, accompanied by a consequent rush from the surrounding air to occupy it. When such a current of air is imperceptible, it is not only harmless, but it performs its part in the salutary work of ventilation: when it is perceptible, it is not only unpleasant, but exposure to it may produce disease.

The object of a chimney is to conduct, without lateral interruption, the smoke and gaseous products of combustion from the lower and denser stratum of atmosphere in which they are evolved to one higher, and that more approximates to them in point of rarity. The power of performing this function is termed the draught; when the action is efficient the chimney is said to draw well, and that power depends partly upon the height, form, and surface of the chimney. The power of draught also varies with different winds, the amount of influence exercised by these depending on a variety of circumstances.

Even with very good joinery in the doors and windows of a house, the influx of air through an infinity of chinks and crannies is inseparably coexistent with the fire in the grate, and its ascending column of smoke and heated air in the chimney; and the fiercer the fire—the more active the current thus produced in the apartment. With badly fitted joiners' work, such currents become a serious annoyance.

Usually, the greater part of the air necessary to the fire enters by the door of the apartment; and a direct line from the door to the fireplace is therefore the chief line of draught, and which the occupants will chiefly avoid: after this line, that from the window is next in importance. Various methods have been contrived for preventing or curing such draughts, the success of which hermetic sealing is generally attended with a commensurate failure in the fire, and consequently in the ventilation. Double sashes in windows, and India-rubber filleting around doors, are of this order, and are objectionable only when used concurrently with an air-opening at some point where the influx is offensive and uncontrollable. Another mode, which is also good or bad according as it is or is not accompanied with separate means of ventilation, is the forming, for the use of the fire, an air-chamber under the hearth, communicating with the exterior of the building by a channel in the floor, terminating at the outside with a grating: a small grating at each end of the hearth, behind the sides of the grate, admits the air to the fire. With an Arnott's valve near the ceiling, communicating with and acted on by the current in the flue, for the efflux of the vitiated air, and another valve, at a similar level and in an opposite quarter from the Arnott, for the influx of the pure, such an arrangement seems free from objection, and indeed very desirable, inasmuch as the efficiency of the fire is enhanced—the chilling effect of the concentrated currents acting on the backs of those seated around the hearth got rid of; but without these accompaniments it must produce a stagnation of unwholesome air in the apartment.

A very proper practice in the construction of floors, especially of those nearest the ground, is to provide for the circulation of air amongst the timbers; but it is obvious that a part of such work should be a provision for preventing the cold air so

circulating from being drawn through the joints of the floor-boarding by the draughts in the chimneys.

It is frequently found that the lighting a fire in one chimney is immediately productive of what is termed a *down-draught* in that of some adjacent apartment. This is simply owing to the chimney in which the down-draught takes place affording the readiest supply of air to the fire that is lit. If the mouth of the down-draught flue is in proximity to another that is emitting smoke, a part of such smoke will probably be drawn down and enter the house, being in that case called *back-smoke*; and it may be that the smoke that is drawn down the one flue is part of that which has just ascended the other. If the mouth of the down-draught flue is not high to the one that is smoking, the down-draught will consist of atmospheric air having a sooty taint from passing through the flue. The prevention or cure of down-draughts, then, it would appear, may be effected by providing for each fire a sufficient supply of air within the chimney opening. CHIMNEY; DAMPER; FLUE; VENTILATION. I. W.

An addition of a sort of capping to the top of the flue, as now carried out by Mr. John Billing, appears to answer its purpose. A few remarks on 'draught', will be found in the *BUILDER Journal*, xiii, 95, 105, 120, 132, and xvi, 142.

DRAUGHT. An old term for a *DRAWING*; or perhaps, in some cases, for the set of drawings necessary to the illustration of a design. An entry "1521; paid for a paper for to draw the draft of the rodeloft, 4d.", appears in the accounts of the churchwardens at Banwell, Somersetshire; RUTTER, *Delineations*, 4to., Shaftesbury, 1829, p. 141: and about 1700, WREN, in a letter to the bishop of Rochester, writes "I shall speedily perfect draughts and models, such as I conceive proper to agree with the original scheme of the architect."

DRAUGHT (Fr. *ciscure*). A border worked on the face of a stone, as a guide for reducing the rest of the surface to its proper form, whether plain or curved. The width of this draught in general depends upon that of the particular chisel employed. In the case of very large stones intermediate draughts are formed. The mason then proceeds, at first by eye, afterwards by a templet or by a sort of straight-edge usually called a banker-rule, to reduce the remaining rough surfaces to the desired plane.

The draught, or draft as it is sometimes written, whether tooled (*i. e.* striped) or plain, is sometimes left visible as a border to a different sort of work on the face of the stone within the draught. A plain draught is sometimes described as chisel-draughted, or fair-tooled draughted, or fine dressed draughted; or as a drowed (for chiselled) margin; or as arris-listed, according to the sort of stone to be worked.

In the northern parts of this island, work that has been draughted over its whole surface with a tool is called *DROVED*. I.

DRAUGHT. This word is explained by BAILEY, *Dict. fol.*, London, 1736, as 'a house of office, boghouse, necessary house;' and by TODD, *Dict.*, 4to., London, 1827, as 'a sink, a drain.' The first of these authors seems to give the sense in which the word is employed by S. MATTHEW, xv, 17, and by S. MARK, vii, 19, where the Vulgate has '*secessus*,' the It. '*latrina*,' and the Fr. *lieu secret*, and to offer the precise meaning of the word in the following passage: 'the chamber over the draught in y<sup>e</sup> allye,' 1535, given in KEMPE, *Historical Notices*, 8vo., London, 1825, p. 208. This may remove any doubt as to the meaning of the word DRAUGHT-HOUSE in 2 Kings, x, 27, rendered in the Vulgate '*latrina*,' as well as of DRAUTE-CHAMBER, which occurs in FENN, *Original Letters*, 4to., London, 1789, iii, 324, and is explained without sufficient reason by BRITTON, *Dict. s. v.*, as a retiring or withdrawing room. It is evidently, from the context, a room containing a bed; although coffers and a desk are to be placed in it; and the letter mentions another draute-chamber in the same house; *i. e.* a bedroom with a privy in it.

DRAW-BORE. To pierce a hole through the cheek of a mortise, through the tenon in its place, and through the other

check, is simply to bore: in order to draw-bore, the holes are made separately, and the necessary orifice in the tenon is placed a little nearer the shoulder: the work is then ready for the application of the DRAW-BORE PIN. This is a slightly tapering conical piece of steel with the largest end inserted in a wooden handle. It is driven through the DRAW-BORE HOLES in order to enlarge them and to bring the shoulder of the tenon close home to the ends of the cheeks of the mortise. When the substances to be thus joined are brought into the desired contact, the workman withdraws the pin and immediately drives in its place a wooden peg or plug, that is sometimes previously slightly wetted. This method of making a joint, is used by carpenters almost always in framing, particularly for partitions, and was as much employed by joiners, but it is generally disused by them in favour of wedging up the tenon. Any old door is likely to show, even through the paint, the heads of the pins one above the other, to each rail. 1. 2.

DRAWING. This term is employed by RAWLINSON, *Masonry—Construction*, given in the *BUILDER Journal*, 1856, xvi, 102, where he observes that "hewn ashlar masonry if set stone and stone, or with thin beds of mortar, and the face-work either backed with rubble or with bricks, must be weak. Neither science nor care can make such hybrid work strong, nor preserve it true in line, on face, vertically, or horizontally: the backing will shrink and draw the face-work." He gives the main front of S. George's Hall at Liverpool as an instance in which the cornice curves inward, from angle to angle, having a versed sine of some four inches.

DRAWING. This word in the singular means the developed idea of the designer expressed in lines; in the plural it signifies all the plans, sections, elevations, and working details necessary to carry out such a design. It is usually stated that, under ordinary circumstances, the drawings belong solely to the architect: he is employed to design and to erect the structure, whatever it may be, with due regard to expenditure, and for that he is paid; the drawings are simply his means of proceeding. As a general rule an architect, in charging for the plans and specifications for a work which has not been executed, is not bound to give them up to his employer; but something would depend on the circumstances of the case. Builders will sometimes refuse to give up the drawings during or after the execution of the work, but a summons before a magistrate has been considered sufficient to meet the case: this appears to be founded upon the acknowledged principle that letters belong to the writer and not to the receiver of them.

It appears difficult to understand how a foundation could be put in, of proper proportions, before the nature of the superstructure had been determined. Yet RAINE, *Catterick Church*, 4to., London, 1834, p. 13, says: "No reference is made in the contract to anything resembling the working-drawing of modern times; nor has the greatest pains, taken for this purpose, been able to discover any such record relative to any other early fabric. The archives of Durham Cathedral have been carefully searched for architectural plans, but without success. A manuscript Commentary upon the prophet Ezekiel, belonging to the Dean and Chapter of Durham, written apparently in the eleventh century, contains some curious pen and ink delineations in the Norman style, of Ezekiel's temple, such as ground-plans, elevations, etc., which prove the architectural skill of the commentator, and the fact that it was no unusual thing to commit to parchment illustrations of this nature. 'Patternes in paper,' 'portraictures,' 'patternes in timber,' are referred to in the contract for the Beauchamp chapel at Warwick in 1439; but during the earlier centuries of our national architecture, we suspect that models in wood, or drawings upon wooden tablets, were in general adopted as specifications by the contracting parties, and referred to during the progress of the work." The value of parchment seems to have been sufficient to cause the erasure of designs upon that material; so that it is hardly reasonable to expect the discovery of any drawings made before



the general use of paper, unless the original owners and their heirs had considered that the preservation of such documents would be useful. Such a feeling does not appear to have existed in England: BRITTON, *Dict.*, s. v. Cathedral, also observes, "it is a remarkable circumstance, that amongst the numerous records preserved in muniment rooms respecting cathedrals, there have not been found any ancient drawings of the ground plans and architectural designs for these splendid national buildings."

If exception be made in favour of the valuable section of the moldings to a door of the church of S. Stephen at Bristol, engraved in fac-simile by WILLIS, *Arch. Nomencl.*, 4to., Cambridge, 1846, from the original in WILLIAM OF WORCESTER'S (or Botoner's) *Itinerary*, preserved in the library of Corpus Christi College at Cambridge, there does not seem to be as yet any knowledge of architectural drawings in England older than those in the British Museum, COTTONIAN MSS., *Augustus I, II, and III*. Among these is 'the monument intended for king Henry the Sixte', beautifully (for the time) drawn and slightly shaded in ink, on parchment 24 ins. by 15 ins., which has been inadequately engraved on a reduced scale in Gough, *Sepulchral Monuments*, fol., London, 1796, ii, 231. Another is entitled 'capella bte. Marie in collegio regali Cantabrigie', and is a slightly tinted view of the exterior of King's College chapel while the interior was being finished; it is on paper, and is 48 ins. long by 26 ins. wide. This is accompanied by a less excellent drawing, 52 ins. long by 15 ins. wide, being the design for a 'campanile regalis Collegii Cantabrigie', which has been engraved on a reduced scale, with many alterations in the drawing, in LYSONS (Magna Britannia), *Cambridgeshire*, 4to., London, 1808, p. 116. A tinted drawing of a gallery intended to be built for Henry VIII may be passed over; but three large drawings, highly coloured, with the decorations in gold, of magnificent pavilions made of tents, deserve much attention. The SOCIETY OF ANTIQUARIES, *Vet. Mon.*, fol., London, 1808, iv, pl. 16-20, has published the pictures of the death (1522), etc., of John Islip, abbot of Westminster, which contain his hearse, chapel, and other details. Many of the CONTRACTS which have been recovered refer to then existing works as models for imitation; a few notices are appended hereto of mention of drawings of late date.

In the Will of Henry VII, 1509, it is declared "we wol that our towmbe bee in the myddes of the same chapell, before the high autlier, and in such distance from the same as it is ordered in the plat made for the same chapell, and signed with our hande": "also that the said chapell be desked . . . as is by us redily devised, and in picture delivered to the priour of Saunt Bartilmew's beside Smythfeld, maistre of the workes of our said chapell." In 1516 was made an agreement with Peter Torrysany for the monument of Henry VII, "according as appereth by the patren"—"all the aforesaide worke shall be graived, and workmanly wroughte according to the saide patren"; ACKERMANN, *Westminster Abbey*, ii, 136-137, 141-2; and 'a plat' signed by the executors of king Henry VII, is referred to in the agreement dated 1513, for vaulting King's College chapel at Cambridge. Considerable difficulty may be expected to arise from the various constructions which may be given to the words 'carve' and 'patterns' in the following extract relating to the building of Roslyn chapel, 1446; wherein it is stated that "to the end the work might be more rare, first he caused the draughts to be drawn upon Eastland boords, and made the carpenters to carve them according to the draughts thereon, and then gave them for patterns to the masons, that they might thereby cut the like in stone"; MS. memoir, Hay's collection in the Advocates' library, Edinburgh; printed in BRITTON, *Arch. Antiq.*, 4to., London, 1812, iii, 51.

The following list comprises drawings mentioned as still existing on the continent, and proves them to have been abundant and of large scale.

A copy, four fifths of the size of the original, supposed to

date 829-36, that is preserved in the library of S. Gall, of a design for the monastery, there, was published by KELLER, Zurich, 1844, and has been repeated, to half the scale of that publication, in the *ARCHAEOLOGICAL Journal*, 8vo., London, 1848, v, 85.

A design on parchment about 11½ ft. long, dating about 1450, for the still unfinished tower to the church of Ste. Waudru at Mons, was published in fac-simile by CHALON, *La Tour*, etc., Brussels, 1844, who notices that at Ghent a drawing of the hôtel de ville is preserved; and that in the town hall at Louvain there is a drawing containing almost every detail of the towers and principal portail of the church of S. Pierre.

The COMITÉ HISTORIQUE, etc., *Bulletin Archéologique*, 8vo., Paris, 1843, mention, i, 311, a portail in west door for the cathedral at Clermont Ferrand; ii, 460, the full size outlines worked on the granite paving covering the vaults of the aisles to the choir of the cathedral at Limoges; ii, 513, 542, the (fifteen or) twenty-two drawings in the Frauenhaus at Strasburg; the magnificent portail of the fifteenth century for a cathedral (? at Barcelona), which was traced by M. Tastu; and ii, 726, five drawings for the church of S. Pierre at Tonnerre, three of which are dated 4 January 1587. The interesting album of Wilars de Honecourt (1250-60?), including sketches of the tower at Laon, of a window at Reims, and plans of the choirs of the church at Vaucelles, of S. Etienne at Meaux, and of Notre Dame at Cambrai, as well as of the absidal chapel at Reims, was edited in fac-simile by Lassus, 4to., Paris, 1858; BUILDER *Journal*, 1858; paper read by H. B. GARLING at the Royal Inst. Brit. Architects, 10 November 1858. DIDRON, *Annales Arch.*, 4to., Paris, 1846, v, 87, gives, at two-thirds of the size of the originals, two out of three palimpsest drawings discovered 1833 at Reims, under a necrology reaching down to 1270, of the principal church in that city. Those that were published exhibit a design for the west front of a cathedral having three large porches, a smaller design of the same character, and some foliage: the restoration shows the careful use of central lines, and complete regularity in the arrangements. DIDRON, who attributes these drawings to the first half of the thirteenth century, also mentions more of the others herein described, which, as he observes, are nearly all of the fifteenth and two succeeding centuries; and adds intimations of the existence of others at Auxerre, Bourges, Montpellier, and in the hands of private persons at Paris and at Treves. The drawings of the tower, of Beauvais cathedral, which fell 30 April 1573, were lately or are still in the possession of M. Dorgedray of S. Lucien near that city, and were engraved by GILBERT, *Notice hist. de l'église*, 8vo., Beauvais, 1830.

DIDRON also notices the existence of a plan on the walls of the cathedral at Freiburg in Breisgau; and states that the sacristy at Ulm possessed an interior elevation of the cathedral, with the name of the architect Ensiger written upon it. A drawing of the tower and spire of the same cathedral belonged to canon Schmidt; this is partly engraved fac-simile, pl. 58 of MÖLLER, *Denkmaler*. Fifteen old drawings have been found at Frankfurt, and others at Munich. The design for Ratisbon cathedral was published in a now very scarce plate, entitled "*Idea cathedralis ecclesie S. Petri in civitate Ratisbonensi juxta verum originale delineata par Melchior Küsel*", fol., Aug. Vind., 1655." The mode of setting out a pinnacle in 1486, by Mathias Roriczer of Ratisbon, was published by REICHENSPERGER, Treves, 1845, and is translated in the *Detached Essays*, 1848-9. An engraving about 2 ft. 9 ins. long, from an old drawing of the celebrated fountain at Nuremberg, was published 1822-4 by Lotzbeck of that city.

An elevation of a tower for the cathedral of S. Stephen at Vienna, 15 ft. long (not the tower that was finished, and afterwards destroyed, but the approved design of a second tower which it was proposed to erect), is engraved in fac-simile in the *BAUZEITUNG*, seven sheets, 1844, pl. 528. At Vienna are also six large plans and elevations of both the towers of S. Ste-

phen's church, by the kirchen-baumeister Gregor Hauser, which were probably made at the time of the repairs in 1519; and also the elevation of a Sakramentshaus, by Michael Fröschel, baumeister of S. Stephen's 1524. The north-west tower and half of the façade of Cologne cathedral, on a parchment roll 3 ft. wide and 9 or 10 ft. long, found in 1814, was published 1818 by MÖLLER, in fac simile, in seven plates. The south-west tower and the whole of the façade is engraved in WILHELM, *Mon. Fran. Inedit.* One of the upper windows of the choir, and a small plan of the south tower; both of these, with an elevation of the second story and a section of the portal to the nave, were apparently drawn by one hand. The plan of the south tower was published in fac simile by MÖLLER; detailed descriptions of these drawings are given in BOISSERÉE, *Cologne*, 4to., Munich, 1843, p. 116-7. MÖLLER, *Denkmaler*, pl. 47, gives a fac simile of a plan (at Strasburg), which he dates thirteenth century, of a tower resembling that of Freiburg cathedral; pl. 48, an elevation (at Strasburg) which he dates thirteenth or fourteenth century, supposed to have been for the tower of the church at Thann near Colmar, built 1450-1500; pl. 53, a church tower at Carlsruhe, after a drawing of fourteenth century; pl. 60-1, fac similes of a plan and elevation for a tabernacle, with plan of another, both at Strasburg, without dates, but late; and pl. 66-70, the plan and elevation of another tabernacle, dated 1462.

It is scarcely necessary to refer to the numberless architectural drawings still existing in Italy, made by the eminent followers of the Renaissance style: almost every city, and large collection, contains a number, more or less, of specimens of their talents. In England, Wren's drawings are preserved in the library of All Souls College at Oxford; many by the still later practitioners will be found in the library of the Royal Institute of British Architects; in Worcester College, Oxford; in the Radcliffe library at Oxford; and in Sir John Soane's museum; the latter also contains the unique collection of drawings by John Thorpe, of the time of queen Elizabeth.

Although not immediately connected with the precise subject of this article, it may be mentioned that not only does the museum at Cologne possess a collection of drawings bequeathed by M. de Noel, of buildings now destroyed; that in the town-hall of Brünn in Moravia drawings are collected of any old building, or of any edifice otherwise characteristic, which is about to be destroyed; that a valuable collection of plans of the churches at Vienna, made by the bau-inspektor Behsel at the beginning of the present century, is also deposited in the magistrats-gebaude; but that the French government has published, under LENOIR, *Statistique Monumentale*, fol., Paris, 1835, etc., details of the old structures that are from time to time disappearing in that city. CONTRACT; DESIGN; EXAMPLE; MODEL; MOULD; PATREN; PATTERN; PICTURE; PLAN; PLAT; TEMPLATE.

**DRAWING BOARD.** The chief duty of a drawing-board is to afford a perfectly level face for the support of the paper on which a drawing is to be made. Its secondary duty is to be so perfectly rectangular as to allow the use of a T square on all the sides. The performance of these duties depends upon the material of which the drawing-board is made, and the choice of material is affected by the manner in which the paper, if it is not left loose or merely fixed by weights, is to be fastened in its place. If the paper be loose, or if weighted, zinc might form an excellent surface for its reception, and has been recommended by YELDHAM, in *Transactions of the Society of Arts*, 1841, liii, 15, pl. 1. But where pins are used, wood must be employed, and this is found to be the best material whether the paper be confined by glue or by paste, or by pressure in a frame. As experience has shown that a mahogany board, even after fifty years of use, will give a stain when damp paper is applied to it, pine is generally adopted. Some persons have given to mahogany as well as to pine a face of oil-paint which, when old, does not seem to be objectionable

for a 'panel-board;' but when paste or glue is used, the paint is injured, and the knife, when dividing the paper, does not make a clean cut.

The 'panel-board' is in common use for paper of a small size. This consists of a rebated panel that can be laid in a rebated frame, the panel being sufficiently less than the frame to allow of the thickness of the paper all round; the panel is slipped into its place at the back, and there secured by two loose bars working in grooves and chases on the inside rebate of the frame. Panel-boards of a large size are necessarily cumbersome, and if the paper is to be strained tightly and evenly, do not constantly answer their purpose. The common drawing-board, when of large size, is best made of two or more pieces, cut out of one thickness, of a well-seasoned pine plank, and either simply glued up, or rebated, or grooved and tongued with cross stuff; these are supposed to be secured from winding by ledges at the back, or by clamps at the ends, or by being fixed as a rebated panel into a grooved frame. The contraction in width, which always occurs, is objectionable in a panelled frame, where it forms one or two quirks; a similar result accompanies the usual application of ledges; and the same cause renders it necessary that the clamps should be shorter than the width of the board. The best mode of making ledged drawing-boards, especially for use in hot climates, appears to be described by HOWLETT in the *Builder Journal*, 1855, xiii, 249. A stand for holding large drawing boards, 7 ft. by 6 ft. and upwards, so as to enable the draughtsman to work conveniently on the middle of it, is given by J. CLEMENT, in *Transactions of the Society of Arts*, xliii, 138, pl. 11.

**DRAWING BOOK.** The following list includes some of the best works on geometrical and ornamental drawing: most of them are to be seen in the library, and in the educational department, of the Department of Science and Art.

*Architectural, Engineering, and Mechanical Drawing Book*, edited by WEALE, fol., text 12mo., 1842; WILMES, *Handbook for Plain and Ornamental Mapping, Engineering, and Architectural Drawing*, 4to., 1846; MINIFIE, *Textbook of Geometrical Drawing, for the Use of Mechanics and Schools, with Illustrations for Drawing Plans, etc., of Machinery, Buildings, etc.*, 8vo., 1851; MAHAN, *Industrial Drawing*, etc., 8vo., New York, 1852; DYCE, *Drawing Book of the Government School of Design*, fol., 1842-3; SMITH, *Projection and Artistic Drawing, containing the Principles*, 8vo., 1843, 2nd edit.; *Directions for introducing the First Steps of Elementary Drawing in Schools and among Workmen*, etc., prepared, etc., at request of the Council of the Society of Arts, 4to., London, 1852; BINNS, *Elementary Treatise on Orthographic Projection*, 8vo., London, 1857, adopted by the Department of Science and Art; *Engineer and Machinists' Drawing-Book*, founded on those of Le Blanc and Armengaud, fol., Glasgow (Blackie), n. d.; CHAMBERS, *Drawing and Perspective*, obl. 4to., 1851; *Examples of Ornament in Every Style*, edited by CUNDALL, 4to., London, 1855; WALLIS, *Birmingham School of Art Drawing-Book*, obl. 8vo., n. d.; GREEN, *Illustrations of the Five Orders of Architecture*, fol., 1856.

LE GRAND, *Dessin linéaire basé sur la géométrie pratique et la perspective*, fol., 1846; THIOLLET, *Principes et modèles de dessins linéaires*, etc., fol., 1838; TUDOT, *Éléments de dessins industriels, ou un cours de dessin linéaire*, etc., 8vo., 1841; ARMENGAUD et AMOUROUX, *Nouveau cours raisonné de dessin industriel, appliqué—à la mécanique*, fol., Paris, 1848-9; NORMAND fils, DOULIOT et KRAFFT, *Cours de dessin industriel à l'usage des écoles primaires supérieures*, etc., obl. fol., text 8vo., Paris, 1841, 2nd edit.; LAMOTTE, *Cours méthodique de dessin linéaire*, etc., 4to., Paris, 1853; CARLES, *Exercices de dessin linéaire*, 4to., Paris, 1854; and *Cours de dessin linéaire industriel*, fol., Paris, 1853; CAROT, *Élémentaire et Progressif, d'Ornement*, 80 pl. fol., Paris, n. d.; PETIT, *Architecture Nouvelle*, etc., fol., Paris, 50 pl., n. d.; BILORDEAUX, *Études d'ornements aux deux crayons*, 78 pl., fol., Paris, n. d. (1848?).



REBOUT et NORMAND, *Études d'ombres et de lavis appliquées aux ordres d'architecture*, obl. 4to., Paris, 1845; *Cours élémentaires de lavis appliquée à mécanique*, fol., 1853; the same, *appliquée à ornement*, fol., 1853; TRIPON, *Études progressives et complètes d'architecture et de lavis*, fol., Paris, 1853; and *Études élémentaires de lavis appliquée à l'architecture*, etc., 150 pl., fol., Paris, n. d.; MORIN et TRESCA, *Modèles de dessins et de lavis*, publiés conformément aux programmes officiels et par ordre de M. le Ministre de l'Instruction Publique, etc., fol., Paris, 1853-4, 36 pl.; PETIT, *Recueil de nouveaux modèles élémentaires de dessin au lavis*, etc., fol., Paris, n. d.

BAUER, *Ornamenten-schule für Gymnasien*, etc., fol., Vienna, 1853; SCHMIT, *Cours du dessin d'ornement à l'usage des écoles des arts et métiers*, etc., fol., Paris, n. d.; WEITBREICHT, *Ornamenten Zeichnungs Schule*, 73 pl. obl. fol., Stuttgart, 1833; ROOS, *Vorlegeblätter für Gewerbeschulen—für Architekten*, etc., obl. fol., Mainz, 1855; DOMSCHKE, *Drawing Book of Architectural Ornaments*, obl. 8vo., Berlin and London, n. d.; BERGER, *Die Kleine Architect, Blätter und Modelle*, etc., fol., Wien, n. d.; *Allgemeine Zeichenschule in Umrissen*, etc., 4to., Hannover, n. d.; HERDTLE, *Umriss von Ornamenten*, 50 pl. lar. fol., n. d.; *Vorbilder für Fabrikanten und Handwerker* (the Prussian Drawing Book) 6 vols., fol., Berlin, 1821-37. ROSENDAHL and ASMUS, *Hilfsbuch beim Zeichnen Architectonischer*, etc., 4to., Berlin, 1848.

DRAWING CHISEL, also called drawing knife and scribing knife. An oblique ended chisel for drawing in the ends of tenons, by making a deep incision with the sharp edge, guided by the tongue of a square.

DRAWING INSTRUMENTS. The instruments really required by an architect are few: indeed a pair of pocket compasses with its shifting pencil and pen legs, contains all that is absolutely necessary. For convenience, however, a case of instruments is usually fitted with dividers and bow-compasses of several sizes and fashions, some having regulating screws; beam, elliptic, proportional, and triangular compasses; drawing pens of several sizes; dotting pens and points; parallel rulers; set squares of various angles; a sector and a protractor; besides a stock of scales and of moulds for plain and compound curves. SIMMS, *Treatise on the Principal Mathematical and Drawing Instruments employed by the Architect, Engineer, and Surveyor*, 12mo., London, 1847; WILMES, *Handbook of Mapping*, etc., 4to., 1846; MAHAN, *Industrial Drawing*, etc., 8vo., New York, 1852. CENTROLINEAD; DRAWING BOARD; SQUARE.

DRAWING KNIFE. A tool used by carpenters and others for taking off thin slices of wood, especially in hollowing work. It consists of a blade about two to three inches in width, lessened at each side, and turned at right angles where each end is set in a handle, so that it can be drawn to the person by both hands.

DRAWING MATERIALS. It is reasonable to suppose that the ancients expressed their architectural designs by the same means that they used for documents and pictures; TURNER, *Some Account*, 8vo., Oxford, 1851, xxxi, suggests in the course of citations from RICKMAN, *Some Observations*, given in the *Archæological Journal*, 8vo., London, 1847, iv, 14, that the drawings of the mediæval period always "were made on vellum. The material used in drawing is not satisfactorily ascertained, but it is said that the use of carburet of iron or black lead has been observed in a manuscript of the twelfth century in the library at Wolfenbüttel. In the absence of that material, however, common lead or chalk were probably used; and the lines might have been afterwards traced with pen and ink, as we observe to be the case in unfinished miniature paintings in manuscripts of early age. RICKMAN was disposed to think that working drawings were sometimes made on wooden tablets, but there is little ground for the supposition." RICKMAN's paper concludes with the notice that "the principal marking materials of the present time are China or India ink, and portions of plumbago set in cedar; of the antiquity of all these

substances I have been unable to ascertain anything at all conclusive. With regard to the means employed for effacing erroneous lines, mention is made of the crumb of bread by some early Italian writers; but this or any other expedient has been superseded by the general use of caoutchouc or Indian-rubber", the introduction of which is noted in the preface to PRIESTLY, *Perspective*, 8vo., London, 1770. Charcoal and sepia were frequently used by the Italian masters.

DRAWING ROOM, properly WITHDRAWING ROOM. The name given originally to the apartment which received those who withdrew from the hall or other dining room after meals: this term is now applied to the room principally used for receptions and entertainments by the mistress of a house. As such its size, which may extend into a suite of two or more rooms with suitable anterooms, depends upon the class of house; while its decoration may exhibit the taste and wealth of the owner, as in the club-houses, where it naturally possesses a decidedly architectural rather than pictorial form of decoration.

DREDGE'S SUSPENSION BRIDGE. A modification, of the ordinary suspension bridge, by which it was sought to make the chains of the strength required to resist the strain to which they were exposed in any particular portion of their length. They were consequently of great size near the points of suspension, and thence taper gradually towards the centre of the span. The suspension rods are also made oblique to the horizontal line, instead of vertical. The mathematical reasoning upon which the inventor based his design was no doubt extremely specious; and even after the numerous failures of the bridges thus constructed, it is difficult to discover the fallacy which must be contained in the elaborate paper on the subject inserted in the *Theory, Practice, and Architecture of Bridges*, 8vo., London (Weale), 1843. But these bridges have failed in so many cases, that the principle upon which they were designed has been definitively abandoned. One great objection appears to be that the chains have neither the weight of the ordinary suspension bar, nor the elasticity of the ordinary wire suspensions; and that oscillations produced by storms or traffic have a greater influence upon these than upon any other suspension bridges.

G. R. B.

The following works detail the principle, etc., of the invention. WEALE, *Bridges*, Suppl. by W. TURNBULL, 1841, with specification, etc., of the bridge over the river Leven at Balloch Ferry, Dumbartonshire; *Mathematical Demonstration*, etc., in *MECHANICS' MAGAZINE*, xxxviii; also in *CIVIL ENGINEER*, etc., *Journal*, 1845, viii, passim; which, xviii, 174, 1855, gives DREDGE's letter comparing bridges on the 'parallel', 'taper suspension', and 'taper compression' principles; with a list of 'taper' bridges. The *SURVEYOR*, etc., *Journal*, i, 99, gives a general account with diagrams; and iv, 1, the bridge at Wraybury, of 100 ft. span. GOODWYN, *Memoir on the Taper Chain Tension Bridge*, fol., Calcutta, 1844. The Ballee Khāl bridge, near Calcutta, which fell in June 1845, 250 ft. span, erected 1844, is described in *MECHANICS' MAGAZINE*, 19 Oct. 1844, and *CIVIL ENGINEER Journal*, viii, 304-7; the bridge in its renewed form, with the report of the Committee on the failure, by Capt. GOODWYN, is given in *Papers*, etc., of *CORPS OF ROYAL ENGINEERS*, 4to., London, 1847, ix, 83, with appendix. The fall of the bridge at Jingurutchy, near Jessore, over the river Kubudduk, Oct. 1846, is noted in *CIVIL ENGINEER Journal*, x, 31, and in *Papers*, etc., 1849, x, 189. The fall of Caerhowell bridge, March 1858, about 140 ft. span, is mentioned in the *BUILDER Journal*, xvi, 112, 186, stating that there are seventy other similar bridges in existence; and viii, 45, notices that over the river Loehy, near Fort William, of 250 ft. span, finished 1850, cost £2000. The Victoria bridge over the river Avon at Bath, erected 1836, 150 ft. span, cost £1650, is described in *CIVIL ENGINEER Journal*, iii, 193. The bridge over the canal in the Regent's Park, London, is given in *Papers*, etc., 1845, vii, 58; and the two other bridges in *SURVEYOR*, etc., *Journal*, ii, 226.

DRESDEN. This city, the capital of Saxony, is situated on the river Elbe, which separates the old from the new town. The buildings that date before the present century are either of that plain description which prevailed in England at the period of William III, though picturesque from the manner in which they group, or they exhibit, like the churches and the other edifices dated after 1700, the rococo style of the followers of Borromini. They are best shown in the illustrations entitled *Prospekte*, with eighteen plates, 1800; and *Dresden mit seinen Prachtgebäuden*, 1818. The river Elbe is crossed by the old stone bridge, 1358 ft. long and about 40 ft. wide, rebuilt 1344; of the twenty-three arches, some have been built up; it was repaired by Poepelmann, 1723-32, and remained with sixteen arches visible until 19 March 1813, when the fourth pier in the water from the old town was blown up; extensive repairs were made after the flood, etc., of 1845. At that period the formation of the railway to Leipzig occasioned the construction of another stone bridge, the Marienbrücke, 1420 ft. long, which being 54 ft. wide, also serves for ordinary traffick. It has twelve arches each 93 ft. 6 ins. span, and two 46 ft. 9 ins., rising 40 ft. above the usual water-line of the river, which sometimes rises 16 ft. in the twenty-four hours when the snow begins to melt: the cost was about £150,000. This is a curious instance of modern facilities: the road and a double line of rails run side by side, and are only separated by a light iron railing; *BAUZEITUNG*, 1852, pl. 499, 500. The Haupt-kirche or Kreuz-kirche, 1764-92, is about 220 ft. long by 140 ft. wide, with a tower 304 ft. high. The Hof-kirche or Katholische-kirche, 220 ft. long by 150 ft. wide, 1737, by Gaetano Chiaveri, and completed 1756-8 by Sebastian, Knoefel, and Schwarz, has a tower 304 ft. high to the top of the cross; its nave shows externally a clearstory of windows in two ranges; Zucchi engraved two fine prints of this structure. The church of the Virgin, Frauen-kirche, built 1726-34 by Baehr, is 124 ft. wide and 172 ft. long with a small chancel, and is decorated with a pseudo-Composite (called Sturm's German) order; it contains five tiers of galleries, is said to hold six thousand worshippers, and is built entirely of the Pirna red sandstone; in 1745 it was finished by Schmidt with a lantern, or rather cupola, which is approached by an inclined plane formed between the two thicknesses of the dome. The Annen-kirche, 1763-9, is also by Schmidt. The Sophien-kirche dates 1599-1602; the Lubomirs-kirche, built as a palace, 1720-24; the Reformirte-kirche, 1768; the Waisen-kirche, 1777; and the Friedrichsstadter-kirche, 1728-30. The synagogue, 1838, has a timber dome 69 ft. in diameter, under a hipped roof (*BAUZEITUNG Journal*, 1847, pl. 105-7); the style is somewhat Lombardic, but the interior has a more Eastern character. The same work, 1844, p. 472-3, gives the statue of Friedrich August by F. Rietschel, and a plan of the site showing the relative situation of the Zwinger, the theatre, the museum then proposed, etc. The Zwinger, as it is popularly called, is an enclosure or courtyard 434 ft. deep and 370 ft. wide, except at the centre of the sides, where it extends to 490 ft. It was intended to form the forecourt to a future palace, and was commenced 1711 by M. D. Poepelmann, and continued until the death of Augustus II; the fronts to the court are given with two plans in the *Kurzer Entwurf or Descr. du Cabinet Royal*, 4to., Dresden, 1755. The building contains an armoury or historical museum, with a museum of natural history and mineralogy; while the front space, formerly open to the Elbe, was filled up by the new picture gallery, built of red sandstone: this part of the edifice was designed by Semper 1846-8, and completed 1855 by Hahnel and Krueger; *BUILDER Journal*, xiii, 479, 552. The theatre, holding upwards of seventeen hundred persons, erected 1838-41, is one of the finest modern edifices in Europe; the interior, entirely dilapidated in 1849, had not been restored in 1854. It has been illustrated by its architect, SEMPER, *Das Koenigliche Hoftheater*, fol., Brunswick, 1849. There is also a smaller theatre in the Reizenitz garden. The royal palace, residenz-schloss, chiefly dating 1534, was

ARCH. PUB. SOC.

restored after a conflagration 1702; it has a tower 355 ft. high, and contains the celebrated treasury called the Green vault, which is a series of rooms upon the ground floor. Attached to this structure is the old picture gallery, formerly the dining hall and lodgings for foreign princes, over the royal stables and washhouses, 1586, with an external staircase to the neumarkt. In the immediate vicinity of the schloss are the remains of the Brühl, afterwards the Electoral, palace on the north, and of the former palace of the younger branches of the Court on the south: of the latter the centre was built 1715, and the wings were added about 1760 and 1770. The old APOTHECARIUM, 1581, ranked with that at Loreto in Italy. The Brühlische garden contains a belvedere constructed 1814 by the Russians, which stands on a basement of six columns of a Doric order *in antis*, attached to the remains of one of the salons of the palace. At some distance to the south is the palace of the prince Anton in the Grosser garten; near which is the haupt-wache or main-guard, with a hexastyle portico *in antis* of an Ionic order, designed 1833 by Schinkel. Another guard-house, called the block-haus, now the artillery main-guard, designed by Bodt, is in the Neustadt, which also contains, by the same architect, the Zinzendorf or Baudissin-haus, and the barracks near the Bautzner-platz erected 1732 from Bodt's design by his pupil Longluene. In the same quarter is the Japanese palace (so called from the collection of foreign and domestic porcelain), built 1715 for F. M. Count Flemming, and sold 1717 to Augustus II; Bodt gave the credit of the façade; Poepelmann and Knoefel, 1732, gave the building its present appearance. In the Neustadt also is the Dreyfaltigkeit kirche, 1732-9; the Kadetten-haus, 1725; the rath-haus, 1750; and a Todten-haus, 1800, deserving of study for its simplicity and arrangements. Of other buildings in the city itself, mention may be made of the canzlei-haus, 1565; the rath-haus, 1741; the Cosel palais by Knoefel, 1762; the Grosse Buenaische-haus, 1744, by Knoefel; the Adam, afterwards Anton-haus, 1744; the Riesch, afterwards Schall, palace (the rear façade by Krubsacius); the land-haus or Chamber of the States, 120 ft. by 200 ft., erected 1774 by the same architect; the mint, 1738; the post and diligence office, 1838; the kaufhalle or exchange, etc., 560 ft. long; and the fountain with a pillar 64 ft. high between several good statues. Almost all the other government offices and royal establishments deserve a visit, especially the arsenal 1559; the orangery in a Renaissance style, 1841; and the marstall, or stables and riding house, 1744. Numerous houses and public educational or charitable establishments are not mentioned here, as their date is uncertain or their designer unknown; the Freemasons' house, 1831, and the palace of prince Maximilian are, however, worthy attention, with the house of the Herr von Seebach, given in the *BAUZEITUNG*, 1844, pl. 589; which also shows, 1845, pl. 540-2, the villa Rosa, erected near the town by Semper, and considered to be the most successful of the modern structures after his theatre: this is also given in the *CIVIL ENGINEER*, etc., *Journal*, 1845, viii, 197. Strangers rarely visit in the environs the Koenigs Weinberg, an elegant residence of the late king; nor the two modern castles erected at a cost of £200,000 by the prince Adalbert. The works upon this city, besides POEPELMANN, *l'Orangerie Royale*, fol., Dresden, 1729; and CANALETTI, *Veduti*; are several *Guides*, etc., exhibiting the usual conflicts of representations and dates: such are the *Neue Ansicht*, Leipzig, 1799; *Dresden und die umliegende Gegend*, 8vo., Pirna, 1801, with a good plan; *Description de D.*, 1807; REINART, *Abbildung*, etc., 4to., Dresden, 1777-81, with plates; LEHNINGER, *Description*, 1781-8, 8vo. text with 4to. plates; DASSDORF, *Beschreibung*, 8vo., Dresden, 1782; HASCHENS, *Umständlich Beschreibung*, 8vo., Leipzig, 1781-4; and (REINHARD) *Lettres sur Dresde*, 1800. A good view of the city as it formerly existed is given in the *Hist., etc., Nachricht von . . . Dresden*, 4to., Frankfurt, 1761; a map of the town, the Pirna, Seethor, and Willsdruffer or Willsche, suburbs, the Neustadt, the Friedrichsstadt or Neustadt Ostra, and the



Antonstadt, is given in the Maps of the Society for the Diffusion of Useful Knowledge, No. 173.

**DRESSER** (in late Latin *directorium*, *dretectorium*, *dressorium*; Fr. *dressoir*). This name is now almost exclusively given to a table placed against the wall, in a servant's room, such as the still room, the butler's room, the kitchen, the scullery, etc. It usually has drawers, a pot-board under them (sometimes the space between is closed by doors), and a shelved back supported by cut standards. It has changed names with the **BUFFET**, from which the original **DRESSOIR** was distinguished by the latter having neither cupboards nor drawers, because it merely served for the display of the plate taken from the buffet. 7.

**DRESSER**. The name of a wooden tool, sometimes called a *beater*, used by plumbers in flattening lead, and in working it into corners and over rolls. It consists of a round handle widening into a hatchet-shaped head, which has a thick round back and a blunt edge.

**DRESSING** (Fr. *parement*). In masonry this term expresses the operations performed upon a stone with the axe or hammer only, or with the mallet and chisel, and further by rubbing where additional labour is necessary, before it is ready to be set in its place. In Scotland, however, the word is generally understood to mean hammer-dressing only. 1.

Whatever stone may be used, the dressing is a most important feature; and the larger the blocks, the greater the care requisite in levelling the beds and squaring the angles. It is an old axiom that the bed of mortar should not be more than a quarter of an inch in thickness. But to disguise slovenly dressing, and to level the blocks when laid, workmen are very apt to underpin them with wedges of wood, splinters of stone, bits of slate, etc. If the beds are irregular the bearing is unequal, and the stone has a tendency to split and rend at the bearing points: such rents, besides their unsightliness, not only betray the danger of unequal settlement, but afford a lodgment for rainwater and dirt.

**DRESSING OF DEALS**. The rough planing them with a fore plane before they were set out to dry: **BUILDERS' DICTIONARY**, 8vo., London, 1734.

**DRESSING ROOM** (Fr. *toilette*). A room, communicating by one door with a bed-chamber and by another with a passage. It is used for the operations of the toilette, and is sometimes furnished with a bath. 1.

**DRESSINGS**. The general name for all kinds of moldings round openings. Thus the term is applied not only to a plain border, called by the French workmen *cantalabre*, but to the most elaborate combination of ornaments round a doorway, a window, or a fireplace. The term is also given by some writers to all kinds of moldings and ornaments on the face of a wall or of a ceiling. 5. 19.

**DRESSOIR**. This term is susceptible of two explanations, according to the mediæval or the modern usage of it. Formerly a *dressoir* was a table, either standing free from the wall or (perhaps usually) attached to it, and having either stages (Fr. *degrés*) or shelves (Fr. *rayons*, *tablettes*), but neither cupboards nor drawers. This peculiarity distinguished it from the mediæval buffet according to Nicot, *Thresor*, fol., Paris, 1606, s. v., who says "buffet est nom commun aux deux, et dressoir particulier à l'un d'eux." The use of this piece of furniture was to afford space for the display of the plate, etc., at meals in great houses. In *Les honneurs de la Cour*, written towards the end of the fifteenth century by Aliénor de Poitiers, and printed in *DE LA CURNE DE SAINTE PALAYE, Mémoires*, 12mo, Paris, 1781, ii, 221-52, it is stated that the *dressoir* of a queen might have five shelves (*degrés*), but that princesses or duchesses, countesses, or wives of bannerets, and wives of persons simply noble, had no pretensions to more than four, three, two and one of such steps respectively; while in some cases no step at all to the *dressoir* is contemplated. **POTTIER, Monumens inédits**, fol., Paris, 1839, pl. 202, states, that probably

this etiquette was only observed on great occasions, and that in private the number of steps or shelves was unlimited. In more recent times the term buffet has ceased to imply the existence of closets, and has been almost confined to a sideboard or side table; whilst the *dressoir*, called also *étagère*, and in the south of France *égouttoir*, is as recognised a part of the furniture of a kitchen in France as the servant's dresser is in England. **VIOLETT LE DUC, Dict. Raisonné du Mobilier Française**, 8vo., Paris, 1858, gives illustrations of the **DRESSOIR**. **BUFFET**; **CREDENCE**; **DRESSER**.

**DREUX** ( . . . **LE** ) or **LEDREUX** ( . . . ), admitted 1742 a member of the Academy of Architecture at Paris, died 1792.

**DRIER** or **DRYER**. A preparation used for the purpose of rendering paint more susceptible of drying. The common 'drier' or litharged oil is generally made by heating linseed oil to near the boiling point in a melting pot, and skimming it: after three or six hours, about one-tenth of its weight of litharge is added to the oil, and the mixture is again heated for five or six hours. Another method is to heat the linseed oil at the boiling point for five hours, then for eight hours at least with peroxide of manganese. **CHEVREUL** decides that oil exposed for six hours to a temperature of, as nearly as possible, 70°, with 10 per cent. of peroxide of manganese, might be employed immediately in painting without the necessity to add any other sicative. Three coats of this dried in nine days, whereas the same number of coats of pure linseed oil boiled for six hours at 70° took thirty-eight days to dry. The addition of white (oxide) of zinc to manganese oil appears to give an increase of sicative property much exceeding what it would give to the pure boiled oil. The previous use for the purpose, of litharge or of manganese, seems to render them more capable of giving the drying property. The effects of carbonate of lead, oxide of zinc, and other substances of adulteration, are detailed in the *BUILDER JOURNAL*, xiii, 337-8, reviewing **CHEVREUL, Recherches Experimentales sur la peinture à l'huile**, Paris, 1850.

**DRIFT**. A name, synonymous with shoot and with thrust, given to the horizontal force which an arch exerts to overset the piers by which it is supported. 1.

**DRIFT** is a name given to a small subterranean way, driven under a hill or other depth of ground, as a guide to the formation of a tunnel or large sewer. A. A.

**DRILL**. A sort of bit for boring small holes. It differs from other bits in having scraping rather than cutting edges; and it frequently resembles in shape the countersink used for metal-work, but it is sometimes made more in the shape of a centre-bit. When used it is fixed in a stock, and motion is given to the tool by various means, known as the brace, the press-drill, the bow-and-string, the torsion-drill stock, and the lathe. The portable hand-drill by Nasmyth and Co. is described, with their other drilling machines, in **BUCHANAN, Practical Essays**, 8vo., London, 1841, p. 432, pl. 29, etc.; which work, p. 416, investigates the subject of the proper shape for the drill, and prescribes an angle of 3° for the slope of its cutting edge, so that it may cut a smooth hole without chattering. 14.

**DRIP**. The fall of water in a slow succession of drops, either from a cornice as mentioned in the following articles, or from glass, slate, etc., as noted s. v. **CONDENSATION**.

**DRIP**. The name formerly given to that member in a cornice, which has a special projection beyond others as well as a form adapted to the purpose of throwing off the rain water, so as to protect the lower moldings and some part of the face of the wall. This duty, especially if there be a gutter in a cornice, ought to be performed by the cymatium above the **CORONA**, if there be such a molding; but it has almost always been left to the **CORONA**, which has been usually called in England by the French name *larmier*, from its rejecting in drops or tears, by means of the throating under it, the water that has trickled down the cymatium and striped with lines the face of the **CORONA**. 2.

To prevent this striping, a small throating is sometimes cut at the top of the cymatium; and occasionally by forming the fillet of the cymatium into a kind of lip, which if carefully done will not be noticed from below. A. A.

DRIP in STONEWORK is the term applied to any projection so molded as to throw off the water and prevent it running back to the wall. H. B. G.

DRIP in LEADWORK. The drop made to form a proper water joint where two sheets of lead join at their ends, in a gutter or flat; this is done to avoid soldering, which is bad, as it prevents the metal contracting or expanding. The end of the board at the top of the drip should be rebated to receive the lead of the lower sheet (as shown in the illustration); the face of the drip being formed by a gutter bearer. The lead of the top sheet is dressed about one inch or more over the drip, to prevent wet driving under, and the lap of the lower sheet three or six inches according to the fall; the apron of the upper sheet ought not to be dressed down too tightly to the lower sheet. Drips should never be more than 15 ft. apart, and 10 ft. is better where practicable. The height should be at least two inches, and if bevelled the drip delivers the water better. Where zinc is employed for cheapness drips should be avoided, the length being laid to an uniform fall. H. B. G.

DRIPPING EAVES. The verge of a roof that has no gutter.

DRIPSTONE. (Fr. *larmier*). This, which has also been called a water table, and a weather molding, is sometimes explained as a horizontal molding on a wall, as the corona of a cornice, and as a head or other corbelled termination to a hoodmold. It is properly applied to a stringcourse that has one of the moldings of which it is composed so worked with a considerable projection and throating as to form a drip. Hence the tablet running round doors and windows is called a dripstone, and if ornamented a canopy, in RICKMAN, *Attempt*, 8vo., London, 1848; to which the editor adds that "this term is not strictly applicable to the moldings over windows in the interior of a building; HOODMOLD is perhaps the best term: LABEL is very commonly used, but is properly applied only to square-headed windows." In fact 'hoodmold' applies to the group of moldings only so far as they follow the aperture, but 'dripstone' as soon as they return horizontally. This series of moldings, by whatever name it may be called, is of the nature of a cornice to protect from the weather the face of the work below, and as used *inside* a building, it is a solecism in Gothic architecture, occurring in the best examples of the best periods.

DROMORE. A small city, in the county of Down in Ireland, which was the seat of a bishopric that has lately been united to the sees of Down and Connor. The town, which seems to derive its name from a neighbouring barrow about 60 ft. in height, has a parish church, formerly cathedral, erected 1661-7; the late episcopal residence, 1792 (previously the residence was at Magheralin); two asylums for widows; and three chapels, one being Roman Catholic, and two Presbyterian. 14. 50.

DRONTHEIM in Norway, see TRONDHJEM.

DROP. The name sometimes given to the GUTTA in descriptions of the entablature of the Doric order. But the term is chiefly suited to any ornament employed in a somewhat similar manner, as a rose or a button, pendent to a bracket. Repetitions of such drops at intervals in a soffit, as in the centres of a large guilloche, have produced some of the best variations of cornices that the present century has invented.

DROP ARCH. The name given in RICKMAN, *Attempt*, 8vo., London, 1848, p. 50, to a pointed arch having the radii shorter than its span. DEPRESSED ARCH.

DROP SCENE, see SIPARIUM.

DROUHET DE DAMPMARTIN (....) was architect of the Chartreuse near Dijon, founded 1583. MAILLARD DE CHAMBURE, *Voy. Pitt. en Bourgogne*, fol., Dijon, 1833, i, 50.

ARCH. PUB. SOC.

DROVE. The name given in the northern parts of Great Britain to a broad chisel or boaster, with which after rough stone has been scappled, and then broached with the pick, the mason proceeds to remove the broach marks, by forming a series of rather irregular stripes of small chequers; the result is called droved, but in some places boasted, and also random tooled work.

Work that is droved and broached is sometimes explained as being broached work enclosed by a margin draughted with a chisel from  $\frac{3}{4}$  to 1 in. wide. But in other cases it would seem as if the term broaching was sometimes applied to two operations; and that when the scappled, broached, and droved stone was to be finished with coarse (and now with fine) tooling, this last tooling or striping entitled the work to be called broached, droved, and broach, or for shortness droved and broached. Thus tooled ashlar is sometimes described as broached in lines not coarser than eighteen in a foot; and if the furrows are produced with a still narrower tool, it is called chiselled ashlar, or droved and striped.

DROVED AND BROACHED. This term means work that has been roughly and then cleanly performed. What is called broached work in Scotland is frequently done without being droved, but formerly good workmanship was held to involve droving before broaching. Thus in some cases it is usual to specify under the head of hewn work that the external courses are to be droved (tooled) with broached tails, i. e. with a fair draught at each side of the angle of the corner stones.

DROVED AND STRIPED. Work that after being scappled, broached, and droved, is striped with shallow grooves about an eighth of an inch in depth, that are sunk below the surface of the droved work, by a chisel that may be from four to six-eighths of an inch in width. 1.

DRUELL (JOHN), see DRYELL.

DRUIDICAL WORKS. In addition to the account already given s. v. CELTIC ARCHITECTURE, reference may be made to the books named s. v. STONEHENGE, and in the following list: BOZE, *Hist. d'Apt, ancienne capitale Celtique*, 8vo., Apt, 1813; PELLOUTIER, *Hist. des Celtes partie. des Gaulois et des Germains*, 12mo., Paris, 1770; CAMBRY, *Voyage dans la Finisterre*, 4to, Brest, 1835-8; SOUVESTRE, *Les Derniers Bretons*, 12mo, Paris, 1854; DUTECIL, *Notice Archéologique sur le Dolmen de Montguyon*; REID, *Bibl. Scotica Celtica*, 8vo., Glasgow, 1832; PEZRON, *Antiq. of Nations, especially of the Celts*, transl. by JONES, 8vo., 1706; RITSON, *Memoirs of the Celts and Gauls*, 8vo., 1827; SMITH, *Gaelic Antiq., or Hist. of Druids, of Caledonia*, 4to., Edinb., 1780; COOKE, *Enquiries respecting Druidical Temples*, 4to., 1775; TOLAND, and Appendix by HUDDLESTON, *History of the Druids*, 8vo., Montrose, 1814; HERBERT, *Cyclops Christianus*, 8vo., 1849; MILES, *Account of the Deverel Barrow*, 8vo., 1825; BARRY, *Cæsar and the Britons*, 8vo., 1832; ROBERTS, *Sketch of the Early History of the Cymry*, 8vo., 1803; DAVIES, *Mythology, etc., of the British Druids*, 8vo., 1809; DEANE, *The Worship of the Serpent*, 2nd edit., 8vo., 1833; FORSYTH, *Beauties of Scotland*, 8vo., Edinb., 1805-8; SHAW, *History of Moray*, 4to., Elgin, 1827; SOCIETY OF ANTIQUARIES, *Trans. passim*; SOCIETY OF ANTIQUARIES OF SCOTLAND, *Transactions*, i, refers to circles in India; and BUILDER *Journal*, xiii, 639; also xiv, 178; J. WILLIAMS, *Druidic Stones*, reprinted from the ARCHÆOLOGIA CAMBRENSIS, 8vo., London, 1850. H. J. WILLIAMS, *On Druidical Remains of the Ancient Britons*, given in ASSOCIATED SOCIETIES, *Papers*, etc., 1852-3, ii, 406.

DRUM (It. *tamburo*; Sp. *tambor*; Fr. *tambour*). Each block of stone, comprising a whole circle on plan, forming when erected the shaft of a column. It may be observed that at the quarries of Selinus in Sicily, such cylindrical courses were extracted by means of a circular passage way 2 ft. 8 ins. in width hewn out of the rock to the entasis of the intended column, and leaving an insulated mass of stone in the centre, of the exact shape and size of the required shaft. To



separate this from the rock, a hole or deep incision, wedge-shaped, was made in the lowest part of the cylinder, in the direction of its centre but considerably on one side. Into this hole it is presumed a wooden wedge was inserted, which when saturated with water would expand and heave up the mass, separating it in the direction of the bed. One mode by which these masses were transported is fully described by VITRUVIUS, x, 6, but some other method must have been adopted in hilly districts. In the case of the columns of the Parthenon, each course, when brought to the building, had then to be worked on the *top* and *bottom* beds in the following elaborate manner. After the two surfaces had been smoothed to a perfectly true plane, radiating lines marking out the divisions of the flutes were next indented by means of some sharp tool. Next three concentric circles were drawn out, also with some sharp instrument, their common centre being the axis of the column. The space between the outer surface and the first line (of about 7 ins. in width) formed a smooth bed left untouched, the only surface of contact when the column was set up. The next space (of 1 ft. in width) was made a degree lower than the surface of actual contact, by being very slightly tooled or scratched over. In like manner the next space (of about 9 ins. in width) was made still lower by being tooled over very roughly. The remaining portion round the centre was left smooth, but was made as low as the surface of the second space. Each course had then to be lifted to its destined place, it is supposed by means of a machine called *trochlea*—an assemblage of pulleys fastened to a pair of shears; at the end of the rope were the *ψαλίδες* or Forcipes ferreos, of VITRUVIUS, x, 2. Some rejected marble drums were found in the Acropolis, having four projecting masses round the blocks. The drums, however, still remaining in the quarries at Selinus have no masses whatever. A square hole in the centre of the shaft was worked at the quarry; in some cases this hole has two sinkings, but perhaps in no instance are they found in the slightest degree dovetailed, but rather the reverse, rendering the use of the *levies*, if known to the Greeks, of no avail. This square hole in the Parthenon is filled with a cube of hard wood in which is a hole to receive the half of a circular pin, also of wood, suggesting the idea that the drums when set, were rubbed against each other, the *δρα* or ears being used in the process. The first drum was set in the place marked out for it by a circle nearly the size of the column itself on the stylobate, and was then turned round and round and ground down to a fine surface; this is seen on the stylobate of the temple of Hercules at Agrigentum: GRANVILLE, given in CIVIL ENGINEER Journal, vii, 241. FRUSTRUM.

The machinery invented by Jarry for sawing at one time six drums or tambours to their circular plan for the Bourse at Paris, is given in ECK, *Recueil*, fol., Liège, 1840, pl. 14.

DRUM. This term has also been applied to the body, otherwise called the bell or the vase, of the capital to a column of the Composite and Corinthian orders.

DRUM (Fr. *tambour*). A wall, either carried by some other construction, or rising itself directly from the ground, and used as the perpendicular support of a dome. The other construction just noticed may be rectangular in plan, or it may be polygonal, under which circumstances the base of the polygonal or circular drum is connected with the lines of the main walling by corbelling or by pendentives. The same means are employed to reconcile the top of the drum to the dome in such a case as the existence of a dome circular in plan upon a drum that is polygonal. DOME.

DRUMMING. A name sometimes given to the operation of "strutting" between the joists of a floor.

DRUM PANELLING. Framing panelled flush on both sides in a framed door to be covered with baize, cloth, etc.

DRY AREA. An enclosure constructed before the wall of a building, sunk below the level of the ground, for the purpose of intercepting the external moisture. It is usually formed by

a retaining wall with cross buttresses, built in such a manner as to ensure an effective ventilation. It is important that the dry area should commence at least as low as the foundations of the building it is designed to protect; and in very damp situations dry areas should be provided with small drains connected with the main drainage of the building, to carry off the superabundant moisture.

Even when a dry area is provided, the usual precautions to prevent damp rising in the main wall must not be neglected. According to modern practice, the retaining wall is sometimes covered with a half arch if the area be wide, springing from a dwarf wall or otherwise, according to the depth of the ground. The most usual practice is to make the area about 8 ins. wide (it should never be less), divided at intervals by cross walls with openings for the necessary current of air; within a foot or two of the surface, it is too generally improperly covered with stone or a brick, as at A, for the surface drainage descends and injures the main wall, even when cemented above the covering. The dry area generally degenerates into a hole for dirt, and vermin. The best arrangement is to make an area wide enough to be easily cleared out, and to which a cat or dog can have access, and to cover it with stone, with moveable gratings at convenient distances; the expense will not be much greater and the result very effective.

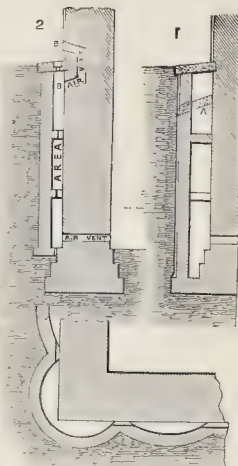


Fig. 1 represents the usual arrangement; the area wall being cemented on the side next the soil for additional precaution; Fig. 2 the plan adopted in France, as described in the *Essay* by VAUDOYER, (for which the first prize was awarded by the Société d'encouragement pour l'Industrie Nationale), given in the *Revue Générale de l'Architecture*, edited by DALY, v, 266, 315, 350, 446; this, as partly translated by DONALDSON, is in the *BUILDER Journal*, 1846, iv, 270-2; CIVIL ENGINEER, etc., *Journal*, vii, 187, 216. VAUDOYER, *Instruction sur les moyens de prévenir ou de faire cesser les effets de l'humidité dans les bâtiments*, pamph., 4to., Paris, 1844. AREA DRAIN; BLIND AREA; DAMP; MOISTURE.

DRYELL (JOHN), clerk, or DAYELL, according to Warden Hoveden's *Registrum*, in the college; or DRUELL, as stated in SPENCER, *Life of Chicheley*, 8vo., London, 1783, pp. 152, 161; wherein he is said to have held "the office of surveyor" during the erection of All Souls college, Oxford (of which college he was made a fellow in 1440), from its commencement 10 Feb. 1437 until 1442; he was collated to the archdeaconry of Exeter, 21 March, 1443-4, and subsequently to the living of Harrietsam in Kent. Roger Keys, fellow 1438, warden 1442-5, under whom the building was completed in 1444, is said to have succeeded him as "surveyor". The records in the college have, however, been searched, but nothing has been found to connect these persons with such an office. Of the original work, the chapel, stalls, some remains of good stained glass, and the quadrangle adjoining with its library, altered into living rooms, are still existing. E. G. B.

DRYING CLOSET (Fr. *étuve*). A chamber in which heat is applied in various ways for the purpose of evaporating water and other fluids from materials. At first a close room was tried, the heat being sustained at a high temperature either by stoves placed within it, or by fires beneath the floor; the latter being of stone or brick. Hot-water, as well as steam,

has been successfully substituted for these means when on a small scale. The next improvement was the provision for motion in the air of the room by proper ventilation. The quickest mode of drying is to heat the closet, the ventilator being closed, to a considerable temperature, and then to open the ventilator so as to let the vapour pass off as quickly as may be deemed convenient. It has been recommended that the smoke-flue should also be the ventilating flue. The next improvement was the provision of an apparatus, now generally termed a 'horse,' upon which the materials to be dried are suspended. By the consequent facility of drawing this machine in and out of the drying-room, the materials are subjected to the necessary heat without exposing the operators to the deleterious action of the impure heated air. These chambers require great precautions in their construction, against the possibility of causing damage by fire: many cases are on record where the destruction of the chamber or closet, and its contents, has apparently proceeded from the heating, without contact with the mode employed. Data as to the amount of heating-surface, in relation to the quantities to be evaporated, and also as to the size of the closets, are given at considerable length in the *Detached Essays*, s. v. **DRYING CLOSET**; to which may be added, the information contained in the *ARCHITECT Journal*, fol., London, 1849, i, 303, 329, 358, 372, 413, 438, which describes the closet in use at the Middlesex Hospital. The *CIVIL ENGINEER Journal* details—Price and Manby's hot-water apparatus, applied to drying of timber, i, 237, 380; Davison and Symington's hot-air apparatus, x, 185, with table of comparative strengths of timber in seasoned and unseasoned states, xii, 310; Napier's drying-stove for timber, illustrated, xviii, 387; P. W. Barlow's patent, April 18, 1856, for seasoning timber by the use of compressed cold or heated air forced through the stick, driving out the sap, and any liquid used of a preservative character, xix, 422; and Rosser, *Observations on Hop-Drying*, in the same volume, 221, may be usefully applied to closets for drying other substances.

**DRYBURGH STONE.** This stone, procured from quarries at Dryburgh, a town on the river Tweed in Scotland, is said locally to have been used at Melrose abbey, of which no portion appears to be older than the fifteenth century. During the interval between the decline of Old Melrose and the rise of the New, there was another sacred edifice erected midway between them in a field still retaining the name of the Red Abbey Stead. It was probably called the Red Abbey from the colour of the stone with which it was rebuilt; specimens that have been dug up seem to identify it with the narrow upper strata of the Dryburgh sandstone, which are of a coarse red colour, every way inferior to the fine broad sandstone strata they overlay, and out of which was built the abbey of Melrose; where traceries of the windows, and the groining of the roof, as well as the beautiful foliage that enriches the work throughout, and especially some of the highly wrought canopies to the niches, remain almost intact, after the changes of so many years in a climate not thought very mild; *BUILDER Journal*, xvi, 591; *BILLINGS, Eccles. Antiq.*, 4to., Edinb., 1848-52; *NEW STATISTICAL ACCOUNT*, ii and iii, 8vo., Edinb., 1845.

**DRYERS**, see **DRIERS**.

**DRYFOÛT** ( . . . . . ), town architect at Middelburg, planned and built 1655-66, the fine cupola church called Oost-kirk in that town. 24.

**DRYING LOFT.** Buildings for the purpose of drying by the circulation of atmospheric air are employed in many manufactories, such as paper stainers, leather dressers, floor-cloth makers, and many others. Two large examples are given for washing establishments in *Annales de Construction*, fol., Paris, 1858, iv, 9, 10, 24.

**DRYOPIC BUILDINGS.** The term suggested as inclusive of various structures exhibiting columnar character, and dating in an extremely remote period, discovered in the neighbourhood of Mount Ocha, in the southern part of the island of

Eubœa, in Greece, which are attributed by professor RANGABE, *Notices of some Additions* (read before the British Association at Edinburgh, 1850), to the tribe of the Dryopes, a branch of the great Pelasgic family expelled from its ancient seat in Thessaly.

**DRY ROT.** One of the forms of decay in timber. The term is a misnomer; this disease ought to be designated a decomposition of wood by its own internal juices, which have become vitiated for want of a free circulation of air; it is therefore a damp rot. The wood affected becomes brittle, and in parts the cohesion of the fibre is so entirely destroyed that it may be pulverized by the finger. Opinions are divided as to the precise cause of dry rot; at present most authors appear to consider that the fermentation of the albumen of the sap retained in the wood, which is aggravated if felled at an improper period of the year, gives rise to the changes observed in the mechanical structure of the timber. After the fermentation has commenced, a species of fungoid growth establishes itself on and in the wood, which absorbs the juices and destroys the coherence of the fibre, and thus produces decay. The *dry* rot differs from the wet rot in this respect, that the former takes place only when the wood is dead; whereas the latter may begin when the tree is standing. In fact the dry rot, as it is called, is the most rapidly developed in warm, moist situations, where there is only an imperfect ventilation; the wet rot, being an organic disease, may continue its destructive action even when the conditions under which the wood is used are apparently favourable. Dry rot takes place most rapidly in the albumen, or sap wood, of a tree; but wet rot may take place indifferently in any part of the log.

As the architect cannot control the operations of the woodman, he must guard against the possible tendency to the production of dry rot, by providing an effectual ventilation around the timbers he employs. If, however, it should be impossible to secure this object, it will be necessary to resort to some of the preserving processes. Of these, the injection of creasote seems to be now that most generally adopted; but the odour is far from agreeable.

Some writers have attributed the cause of dry rot in fir timber to the system of floating newly cut timber before the evaporation of the sap, and of subsequently putting the timber into the hot and close holds of timber ships; but the opinion loses much of its probability as the same authors ascribe the cause to the habit of felling at an improper season, so that the sap is quickly evaporated and the pores never close. All authorities agree that when timber in a wall has been much affected by dry rot, the wall generally retains the disease after the removal of the timber. Amongst the most practical remarks upon the subject may be classed those by MONTEATH, *Forester's Guide*, 8vo., Edinburgh, 1824, pp. 309-369, who states that the rot is a canker or gangrene arising either from disease in roots, by insects, by moss or damp, by canker, or by external injury; that sapwood always begins to mortify if trees lie long in the log; and that this gangrene is infectious in standing timber as well as in logs and in planks. He recommends that all trees should be barked between the end of March and the beginning of September; that they should be allowed to stand during a full twelvemonth; and that when felled in the autumn, even in October or November, they should have the sap or white wood hewn away.

The following fungi are considered as the cause of dry rot; *Boletus lachrymans*; *Merulius lachrymans*; *Polyporus destructor*; and the genus *Sporotrichum*. **DECAY; DECOMPOSITION; ANTI DRY ROT PROCESS; CHEMISTRY OF BUILDING MATERIALS; WET ROT.**

"In Norway, the finest birches are often stripped of the bark, which is called 'naver,' and is used all over Norway beneath slates, tiles, earth, or whatever may be the covering of a roof, to prevent the wood underneath from rotting. All



posts which are in contact with the earth, whether forming fences, bridge-rails, or gates, are always carefully wrapped round with flakes of birch bark for a few inches above and below the ground."

Wherever joiners' work is to be fitted to newly built walls, means should be taken for the circulation of air behind it. Beams and joists used for the ground floor of a house should be of British oak, larch, or the best foreign fir. The ends of beams or joists inserted into the outer walls of a new house, should be cased with sheet lead, zinc, cast iron, or fire brick, as being impervious to moisture; a space being left round the timber. The wooden fillets on which the lower edges of skirting boards are to be nailed, should not be in continuous lengths; admission of air should be permitted between the ceiling and the pugging; between the pugging and the flooring; and between the earth and the underside of the floor, if on the ground story. Many soils contain vegetable corruption, which occasion destruction if subjected to a warm and moist atmosphere. Mortar impregnated with stable soil; hollow walling; dry areas badly built, or when narrow and not sufficiently ventilated; oil cloth covering a floor having a damp soil, cesspools or drains, without ventilation, under it; all tend to produce dry rot.

The various modes of preventing dry-rot in timber may be thus enumerated. Charring; coating with coal-tar; saturation, by hydraulic pressure, with silicic acid; boiling in limewater; steeping in limewater for ten days or a fortnight, according to Mentenath's experiment, given in SELBY, *British Forest Trees*, 8vo., London, 1842, p. 408; the Paynizing process, sulphate or muriate of lime and sulphate of iron and water; the Kyanizing process, bichloride of mercury, *i.e.* corrosive sublimate and water; Margary's process, sulphate of copper and water; Bethel's process, creasote, *i.e.* oil of coal-tar and a crude solution of acetate of iron, commonly called pyrolignite of iron; Burnett's process, chloride of zinc and water; and Boucherie's process, a solution of pyrolignite of iron; he proposes to impregnate the tree either by the root or by the bole with a solution of impure pyrolignite of iron, prior to its being cut down. Chloride of copper coagulates albumen; and therefore as this property does not exclusively pertain to corrosive sublimate, it might be substituted for the latter. Other modes are by green copperas, *i.e.* sulphate of iron by itself or with lime water; by an application of one of beeswax, two of roll brimstone, and three ounces of oil, to three-quarters of a gallon of water, boiled together and laid on hot (Dr. Parry); by solution in lime water, and then, after drying, in a weak solution of sulphuric acid; and by a strong solution of muriate of soda, or common salt, if dryness is not an object.

The following are some of the remedies which have been applied to infected wood: From the ship *Eden* every trace of fungus was eradicated by its remaining eighteen months under seawater; *Society of Arts Trans.*, 1819, xxxvi, 53. A heat of 300°, where it can be applied, may be adopted with certainty of arresting the progress of fungus growth. Margary's process used four times as strong as for prevention. A pure solution of corrosive sublimate in water, one ounce to a gallon, used hot. Sulphate of copper (blue vitriol) half a pound to a gallon of water, used hot: sulphate of iron is sometimes used, but is not thought so good; sulphate of zinc and sulphate of copper, in the proportion of one pound to four gallons of boiling water, is considered better. A mixture of the solutions of copper and iron, as one part of copper to three of iron, three pounds of this to a gallon of water, and boiled for five or six hours or more. Smiths' ashes from a foundry applied against the defective parts, or the leavings of iron-filings or dross.

Charred plates and joists laid on anchor-smiths' ashes were found to answer, but two uncharred plugs caught the disease. The living tree impregnated with sulphate of copper, in the the proportion of one pound to a gallon of water, or with acetate of copper, one pound to a pint of vinegar and a gallon of water, was found in perfect preservation, clean, dry, and

free from fungus, after seven years packing in decaying saw-dust in a warm, damp cellar: the remainder of the specimens, which were saturated with nitrate of soda, prussiate of potash, pyrolignite of iron, sulphate of iron, common salt, and creasote, presented much decay and a large growth of fungi. Kyanised wood varied in an anomalous manner. At the Woolwich pits, which closed in August 1836 and opened in 1841, Burnett's process was considered to be in everyway successful. At Welbeck, in some experiments in the mushroom house, good Baltic timber lasted longer than the best Kyanised oak; Kyanised and un-kyanised oak decayed equally fast; Burnettized wood, and that not so treated, decayed alike; deals of Scotch fir, and copperas, *i.e.* sulphate of iron, with lime water, resisted decay longer than any of them.

There is not sufficient proof of the action of some of these processes, or that they will be permanent: some have been known to fail after a few years.

PAFWORTH, *On the Causes and Cure of Dry Rot*, etc., 4to., London, 1803; BOWDEN, *Treatise*, 8vo., 1815; CHAPMAN, 8vo., 1817; BURRIDGE, 8vo., 1824; WADE, 8vo., 1815; MACWILLIAM, 4to., 1818; and RANDALL, 8vo., 1807. FARADAY, *On the Practical Prevention*, etc., 8vo., 1836; DICKSON, *Lectures*, 8vo., 1836; LINGARD, *A Philosophical, etc., Inquiry*, etc., 8vo., 1842; HAVILAND, *Measurer*, etc., 8vo., 1817; BIRKBECK, *Lectures on Kyan's Patent*, 8vo., 1835; GREGSON, *Dry Rot in the Navy*, 8vo., 1816; KNOWLES, *Inquiry*, etc., 4to., 1821; BLACKBURN, *Treatise on Ship-Building*, etc., 4to., 1817; PARRY, *Inquiry into the Causes of Decay*, etc., in the *Transactions of Bath Agricultural Society*, given in NICHOLSON'S *Journal of Natural Philosophy*, etc., 8vo., London, 1807, xix, 328, and 1808, xx, 69, 102, partly reprinted in the *REPERTORY OF ARTS*, etc., 8vo., London, 1808, 2nd series, xiii, 50, 93; DEANE, *An Account of the Rapid Decay of Timber—in the Church of the Holy Trinity at Cork*, given in the *Transactions of the Inst. of Civil Eng. of Ireland*, ii; and in the *BUILDER Journal*, vii, 321; which also contains articles in iii, 32, 87; *CIVIL ENGINEER Journal*, iii, 418; *Report of the FINE ARTS COMMISSION*, 1835, p. 204; BALFOUR, in *Transactions of the Architectural Institute of Scotland*.

DUBBING OUT. A term used by bricklayers and plasterers for the coarse materials, such as flat tiles, tarred twine on nails, etc., used to form projections or to bring to a level face any work which is to be covered with cement, stucco, or plaster. CORE. CRADLING. BRACKETING. 1.

DUBHOY or DUBBOL. A nearly depopulated city, with remains indicating great magnificence, in the province of Guzerat in Hindostan. It is said to take its name from the architect Dubhoway, who, at the end of thirty-two years of service, asked that honour as his final reward from his prince. Little notice has been taken of this place since 1775-80; but FORBES, *Oriental Memoirs*, 4to., London, 1813, ii, 123-400, describes it as nearly square, two miles in extent, once surrounded by a high wall and fifty-two towers, built like all the other works, of large hewn stone, which must have been brought from distant mountains, as not a pebble is to be found in that part of Guzerat. The wall has been razed, but the double gates with a spacious colonnaded area between them in the centre of each side, and the west side, where the terreplein is supported by a highly ornamented colonnade half a mile in length, remain: the works were restored with earthworks by FORBES, who gives a view of the Diamond or eastern gate, 320 ft. long, which he considers, with its attached temple, a most complete and elegant specimen of Hindoo work. Within the walls is a tank, three-quarters of a mile in circumference, with a flight of steps all round it.

DUBLIN. The chief city of the county of the same name, and the capital of Ireland. It is situate on each side of the river Anna Liffey, one mile from its entrance into the bay of Dublin, a semicircular basin eight miles in diameter. The

city is nearly insulated by the Royal canal on the northern side, which is navigable for vessels of from eighty to a hundred tons, being 42 ft. wide at the top by 24 ft. at the bottom; and on the southern side by the Grand canal, the most important line of water communication in Ireland; it is 45 ft. wide at the top, 25 ft. at the bottom, with 6 ft. depth of water. Both sides of the river are embanked with granite, forming spacious quays completed in 1818; the walls are 12 ft. thick at bottom; that on the south side is two miles and a quarter, and that on the north side one mile and three-quarters long. It is crossed by eight bridges; Sarah, 1791, by Alex. Stevens of Scotland, has a segmental stone arch 104 ft. span, rising 30 ft. above high, and 40 ft. above low, water mark, its total length is 256 ft., with a passageway of 38 ft. in width; Queen, 1764-8, under the inspection of Colonel Vallancey, having three stone arches, is 140 ft. long and 40 ft. wide; King, 1827, by G. Papworth, R.H.A., 100 ft. span, 30 ft. 9 ins. wide between the parapets, cost £13,000, is of iron with granite abutments; another (not yet named), 1858-9, by G. Halpin, C.E., has one iron arch 95 ft. span, rising 9 ft. and 33 ft. wide; Richmond, 1813-6, by J. Savage of London, has three arches of Portland stone, cost £25,800, it is 220 ft. long by 52 ft. wide; Carlisle, 1791-4, has three granite arches with the ballustrade of Portland stone, it is 210 ft. long by 48 ft. wide; Wellington or the Iron, for foot passengers only, 1815-6, of one segmental arch, is 140 ft. long, 12 ft. wide, cost about £3,000; Essex, 1753-5, by G. Semple, has five stone arches, cost £20,661:11:4, is 250 ft. long by 51 ft. wide (SEMPL, *Treatise on Building in Water*, 4to., Dublin, 1776, and London, 1780, 2nd edit.); and lastly Whitworth, 1816, has three stone arches, and resembles Richmond bridge.

The old portion of the city near the castle and cathedral has narrow, dirty streets, inhabited by the poorer population; the better streets, lit with gas since 1825, are well paved, the roads generally macadamized and lined with houses of brick presenting a good appearance; Sackville-street, 120 ft. wide between the houses, is 1950 ft. long; nearly the whole of this portion of the city has been built since 1610. The water supply, cir. 1812, is obtained from the canals. There are five main public squares; S. Stephen's-green, one of the largest in Europe, was formed in 1670, laid out and planted in 1818, the enclosure 1220 ft. by 970 ft. contains rather more than 27 statute acres; Merriion-square, of about 12 acres, dates 1762. Phoenix Park, containing 1089 Irish, or 1759 English statute acres, was completely laid out in 1745, when the Corinthian pillar, 80 ft. high, was erected from the designs of the Earl of Chesterfield or of Mr. Penrose, architect to the Board of Works. The viceregal lodge was originally erected 1784, the wings added 1802, with a Doric portico 1808; and the Ionic colonnade by F. Johnston about 1816. The Botanic Garden at Glasnevin contains 27 acres 20 perches, English; the College Botanic Garden, 1807, is about 4 acres in extent.

The oldest of the two cathedrals, Christchurch or the church of the Holy Trinity, was founded in 1038, rebuilt 1140; the only remains of an early date are the crypt, north wall, some zigzag moldings in the clearstory and triforium of the transept, cir. 1170, and a portion of the south side of the nave; the east window was destroyed in 1461, and the stone roof and part of the south wall fell in 1562, but were rebuilt in the same year; the choir 1358, the east end of which defects towards the north, is about 108 ft. long and 25 ft. wide; the nave is 126 ft. long (including the transepts, which are 88 ft. 6 ins. long and 25 ft. wide) and 25 ft. wide; the aisles are each 13 ft. wide, the pillars 5 ft. 8 ins. diam.; S. Mary's chapel, 1512, on the north side of the choir, a plain building, is 60 ft. by 26 ft. The other, or S. Patrick's cathedral, founded 1190, was rebuilt with additions in 1364; the steeple 1370-6, is 120 ft. high, the spire 103 ft. high was added 1749-50 by G. Semple. Repairs were made at various times, especially in 1853, when also a new pulpit and throne were put up, the latter with a canopy removed from

Chester cathedral. During 1858-9 other works were undertaken to the main building, as well as a new chapter house at the east end, Skerries stone with Caen stone dressings being employed throughout. The nave is 130 ft. long, 30 ft. wide, with pillars 5 ft. thick; the aisles each 14 ft. wide; the transepts, 157 ft. from north to south, contained the old chapter house, 32 ft. long by 29 ft. wide, and the parish church of S. Nicholas, 50 ft. long by 32 ft. wide, rebuilt about 1825. The choir is 90 ft. long; and the Lady or S. Mary chapel 55 ft. long. Adjoining is the ancient archiepiscopal palace, now used as a police barrack; the deanery, erected in the last century; and the library, founded by archbishop Marsh in 1694.

There are about twenty parish churches, nearly all in the Italian style, and as many non-parochial; those most deserving of notice are, S. Werburgh, rebuilt 1754-9, now without a tower; S. Thomas, 1758-62, by John Smith after a design by Palladio, is also without a tower; S. Catherine, rebuilt 1760-9 of granite, by John Smith; S. Andrew, partly rebuilt 1793-1807 of granite, by F. Johnston, is of an elliptical form, 80 ft. long and 60 ft. wide on the two axes, by 43 ft. high; its acoustical properties are very defective; cost £22,000; the tower of Gothic character was discontinued above the lower story; and S. George, 1802, by F. Johnston, is 92 ft. long and 84 ft. wide externally, and 80 ft. long by 60 ft. internally, having a passage round communicating with the seats; the steeple is 200 ft. high, and the six columns to the Ionic portico are each 3 ft. 6 ins. in diameter; cost about £50,000. Amongst the others are S. Michan, founded 1095, rebuilt 1676, but since greatly altered, the vaults of which are remarkable for their antiseptic properties; S. John, rebuilt 1773; S. Luke, 1708; S. Mark, 1729-60; S. Bride, 1648; S. James, 1707; S. Audens or Owens, has some remains of the tenth century, but was rebuilt 1826, the Portlester aisle or chapel dates 1455; S. Stephen's chapel, 1825 (Grecian), by J. Bowden, cost £5,000; and Sandymount (Romanesque), 1852, is by B. Ferrey of London.

Besides about twenty-five places of public worship of various denominations, there are about twenty-seven Roman Catholic chapels; the friaries and convents are numerous, and mostly recent. The Roman Catholic cathedral or metropolitan chapel, 1816-9, by Messrs. Morrison and Taylor, is 118 ft. long in front and 160 ft. deep, the walls are of granite; the portico, of Portland stone, has six Grecian Doric columns, each 4 ft. 9 ins. in diameter; the great aisle being 150 ft. long by 120 ft. wide, accommodates 1000 persons; the estimated cost was £50,000. S. Francis Xavier, 1832, by J. B. Keane, of granite, cost £18,000; S. Catherine, Meath-street, 1858, by J. J. MacCarthy; S. Nicholas, Francis-street (Italian), before 1844, by the late — Leeson, was completed 1858; S. Andrew, Westland-row, 1832-4, by J. Boulgar, cost £13,000; S. James (Decorated), 1859, by P. Byrne; the Roman Catholic university church (Italian), 1858, by J. H. Pollen of London, has a nave 100 ft. long, 36 ft. wide, and 40 ft. in height; the antechapel is 35 ft. long by 20 ft. wide; various native marbles are employed in the interior; S. Saviour's (Decorated Gothic), nearly completed 1859 by J. J. MacCarthy, 171 ft. long, 60 ft. wide, with the chapels 96 ft., and 75 ft. high to the uppermost part of the ceiling, BUILDING NEWS, iv, 399; S. Lorcan Ua Tuathal (vulg. S. Lawrence O'Toole), by the late J. B. Keane, completed 1858 by J. Bourke, cost £10,000; and the Carmelite friary chapel, 1822, by G. Papworth, R.H.A., 200 ft. long and 36 ft. wide.

The Golden bridge cemetery, 1827, of two acres; Prospect cemetery at Glasnevin, 1832, of nine acres, but now (1858) of forty acres, with chapels by P. Byrne, contains the round tower 170 ft. high, erected to the memory of O'Connell; and the monument to Curran by John T. Papworth, A.R.H.A.; Mount Jerome at Harold's Cross, 1836, of twenty-five and a half acres, the chapel by W. Atkins of Cork, are the chief burial grounds. DUBLIN BUILDER Journal, 1859.



The castle, built cir. 1205-20, was converted into a viceregal residence in 1560, and some repairs were completed 1567; it contains two large courts; great part of the buildings were destroyed by fire in 1684, the garden front dates 1740; the wardrobe or record tower, was altered 1813-7 by F. Johnston; the Bermingham tower was rebuilt 1775-7; the ball-room or S. Patrick's hall 1783, is 82 ft. long, 41 ft. wide, and 38 ft. high, and formed part of the original structure. The castle chapel, 1807-14, by F. Johnston, of rich Gothic work, built of Calpe or common black Irish stone, cost £42,000, consists of nave and aisles, 73 ft. long by 35 ft. wide; the ninety heads on the outside are of a dark blue marble from a quarry at Tullamore, forty-six miles from Dublin, said to resist the action of the atmosphere; ILLUSTRATED LONDON NEWS, xv, 108. The Four Courts (Corinthian), comprising the courts of Queen's Bench, Chancery, Exchequer, and Common Pleas, was commenced in 1776 by T. Cooley, who dying shortly after the completion of the west wing, was succeeded by J. Gandon, who somewhat changed the design in finishing the works 1786-1800; the courts were opened in 1796; they are entered from the angles of a square enclosing the central hall, 64 ft. diameter, cost £93,788; the length of the principal front is 450 ft., and the mean depth 170 ft.; the eastern wing is now (1859) being erected under the superintendence of J. Owen, at an estimated cost of above £12,000. The Inns of Court, 1802, of granite, arc by Messrs. Gandon and Baker, the dining hall is 81 ft. long and 42 ft. wide, the library 42 ft. long and 27 ft. wide; the library buildings, 1827, by F. Darley, cost £20,000.

The royal exchange (Corinthian), 1769-79, by T. Cooley, is about 100 ft. square, of Portland stone, and cost £40,000. The custom house (Doric), 1781-91, by J. Gandon, is 375 ft. long and 205 ft. in depth; the south front of Portland stone, the others of granite but with Portland stone dressings; the top of the statue on the cupola (which is 26 ft. diameter) is 125 ft. high from the ground, the statue itself being 12 ft. high; the long room is 70 ft. long by 65 ft. wide; cost £250,821.

The Bank of Ireland (since 1802), formerly the Parliament House, 1729-39, by — Penrose, architect to the Board of Works, cost nearly £40,000; some writers state it to have been erected by Thomas BURGH and Sir William Piers; others "under the inspection of Sir Edward Lovett Pearce, and finished by Arthur Dobbs, who succeeded him as engineer and surveyor-general"; whilst it is also given to R. Cassels, but he was probably not in Dublin at that early period; the House of Lords, now known as the Court of Proprietors, is 30 ft. wide and 40 ft. long, with 20 ft. more for the bar; the east front, 1785-7, by J. Gandon, cost £25,000; he was directed to add the incongruous portico of six Corinthian columns, each 3 ft. 6 ins. diameter; the west façade with the Ionic colonnade 147 ft. long, 1787-94, by E. Parke, cost £25,396; in 1802-4 extensive alterations were made by F. Johnston in the interior, for the purposes of the bank; the cash office, of Bath stone, is 70 ft. long, 53 ft. wide, and 50 ft. high to the ceiling of the lantern. The royal bank, 1858-9, C. Geoghegan, cost £4,787.

The other chief public buildings comprise the following: the old stamp office, formerly Powerscourt house, 1771-4, by G. R. Mack, "stone cutter", cost £10,000; it was purchased for £15,000, and the additional works, 1811, cost £15,000; and is now occupied as a silk warehouse. The post office, 1815-7, by F. Johnston, is of granite, the Ionic portico, of Portland stone, is 80 ft. long, of six columns, each 4 ft. 4 ins. diameter; it is 223 ft. in front by 150 ft. in depth, and 50 ft. high to the top of the cornice, and cost about £50,000. The mansion house has a ball room 55 ft. long, wainscoted with Irish oak; a circular room, 1821, by G. Semple, 90 ft. in diameter and 50 ft. high, is encircled with a corridor 5 ft. wide; and other rooms. The sessions house, 1792-7. The royal Dublin Society, since 1815 (formerly Leinster house, 1745, by R. Cassels), 140 ft. front, is of granite and Portland stone; it was purchased for £20,000; the drawing schools, 1825, by H. A. Baker; the interior re-

arranged and exhibition galleries erected, 1841, by J. T. Papworth, A.R.H.A.; the grounds adjoining were occupied in 1852-3 by the building for the Great Exhibition opened in the latter year, by Sir John Benson, at a first cost of about £47,000, eventually increased to about £80,000; the great hall was 425 ft. long, 100 ft. wide, and 105 ft. high; BUILDER JOURNAL, x, 589, the plan given 593 is not correct, as noted xi, 321; xi, 8, 321, 329; ILLUSTRATED NEWS, xxiii, 210; and the EXHIBITION EXPOSITOR, fol., Dublin, 1853: the Exhibition building, 1858, by F. V. Clarendon, is 200 ft. long, 40 ft. wide, and 50 ft. high to lantern; the cattle yard, roofed and rearranged, 1858, by F. V. Clarendon, cost £6,000? The building for the National Gallery, by C. Lanyon of Belfast, on amended plans by Capt. Fowke, have been commenced 1859, at a cost of £17,000. The royal college of surgeons, 1806, by E. Parke, cost £40,000, it was redecorated and enlarged 1825 by W. Murray, at a cost of £7,000; the museum is 73 ft. long by 33 ft. wide.

Among the numerous charitable institutions, the earliest is that of the royal or old men's hospital, Kilmainham, 1680-4, said to be after a design by Sir C. Wren, accommodating about three hundred soldiers; it forms a rectangle of 306 ft. by 288 ft., and is of brick, the interior court is 210 ft. square; the dining hall, 100 ft. long and 45 ft. wide; the chapel 86 ft. long and 36 ft. wide; cost £23,559. The royal military infirmary in Phoenix Park, 1786-8, by W. Gibson, of Portland stone, cost £9,000, extends 170 ft., with wings 90 ft. in depth. The blue coat hospital, 1773-7, by T. Ivory, of Portland stone, cost £21,294, accommodating at least a hundred and fifty boys; it is 360 ft. long in front; the chapel is 65 ft., and with the gallery 76 ft., long, 32 ft. 6 ins. wide, and 32 ft. high; the school is of the same size, and 20 ft. high; the dining hall 52 ft. long and 30 ft. wide. The lying-in hospital, 1751-7, 'the first of its kind erected in the British dominions', by R. Cassels, of granite, cost £20,000; it is 125 ft. in front and 82 ft. in depth: the rotunda adjoining, 1757, by G. Ensor, 80 ft. diameter and 40 ft. high, is chiefly used for concerts; its acoustical effects are said to be good: the new rooms communicating, 1785, by R. Johnston and Frederick Trench, Esq., comprise a tea room 56 or 60 ft. long and 24 ft. wide, a ball room 86 ft. long and 40 ft. wide, with a supper room over of the same size. Richmond lunatic asylum, 1811-5, has two hundred and ten cells, and cost £50,000; Swift's hospital for lunatics, 1745; S. Patrick's hospital, 1749-57, by G. Semple, "the builder employed", has a hundred and fifty-eight arched cells, each 12 ft. by 8 ft.; S. Joseph, Roman Catholic institution for deaf and dumb at Cabra (Tudor), 1856, by C. Geoghegan, of rubble limestone, pebble dashed, with red Wexford brick dressings and granite cills, copings, etc., accommodating at present a hundred children, cost £5,000, illustrated in BUILDER JOURNAL, xv, 606; Lock hospital, 1792; Simpson's hospital for the blind, 1778-81, cost £6,458, dining hall and infirmary, over £2,000 in addition; Dr. Steevens' hospital, 1720-33, greatly repaired 1805-8, cost £16,000, it is 233 ft. long and 204 ft. wide, with an interior court 114 ft. by 94 ft.; Sir Patrick Dun's hospital, 1798-1803, 194 ft. long, by H. A. Baker, the centre and west wing cost £15,460; and Meath hospital, dates 1774.

Dublin penitentiary, 1813-9, of limestone, 700 ft. in front and 400 ft. depth, cost £30,000; Richmond bridewell and penitentiary and house of correction, 1812, by F. Johnston, for four hundred persons, 700 ft. in front, of black stone and granite, cost upwards of £50,000; sheriff's prison for debtors, 1792-4; Kilmainham or county gaol, 1680-6, main building, 178 ft. long by 102 ft. wide, has two courts, each 55 ft. by 40 ft., and others around it forming an extent of 283 ft. by 90 ft., cost £23,559, it is 1859 being remodelled by J. MacCurdy, at a cost of £7,000; Newgate prison, 1773-80, by T. Cooley, badly arranged, is 170 ft. in front and 127 ft. deep, cost £16,000; city bridewell; two union workhouses; the royal barracks, 'the most noble erection of this kind perhaps in Europe', date

from 1706, and can now accommodate three thousand men; there are also six others in the city and its vicinity.

The commercial buildings, 1796-9, by E. Parke, of granite; the corn exchange, 1816-9, by G. Halpin, C.E., of granite, cost £22,000; the hall, 130 ft. long and 70 ft. wide, has the ceiling supported by six cast iron columns; the stone tender house, 1815, cost £12,964: 12: 10; the agricultural hall, 1858, by F. V. Clarendon; the ten or twelve markets are not of any architectural merit; the theatre royal, 1821, by S. Beazley, was redecorated under J. MacCurdy in 1858.

Trinity college (Corinthian) has a façade, 1759, 300 ft. long, and comprises now three courts; the first is 560 ft. long and 210 ft. wide, the length divided into two by a campanile, 1853, by C. Lanyon, 40 ft. square and 95 ft. high. Near the entrance to the court are the chapel, 80 ft. long, exclusive of the recess 40 ft. wide, and 44 ft. high, cost above £12,000; the theatre corresponds; the refectory, 70 ft. long, 35 ft. wide, and 35 ft. high, accommodates three hundred persons; and the apartments for the fellows and students; this portion is by Sir W. Chambers, carried out by G. Meyers, 1759-80. Beyond the campanile and on the north side is the library, 1732, 210 ft. long, 41 ft. wide, and 40 ft. high, containing about 150,000 volumes; the Fagel library adjoining, 52 ft. long, 26 ft. wide, and 22 ft. high, has 27,000 volumes; the MS. room is over. To the north of these is Botany Bay court, having a north façade 270 ft. long, contracted for in 1818 by Mr. Ward for £26,000; the foundations alone cost £6,500; in this court are the anatomy house, 1824, 115 ft. long and 50 ft. wide, by Messrs. Morrison; the lecture room 30 ft. square, the anatomical museum 30 ft. long by 28 ft. wide, and the dissecting room, which extends the whole length of the building. The general museum is 60 ft. long by 40 ft. wide. To the east is the third court or Park-square, containing the new museum buildings, 1852-5, the plans by J. MacCurdy, the elevations by Messrs. Deane, Son, and Woodward; estimated cost £25,000, exclusive of gallery in museum and fittings; *CIVIL ENGINEER Journal*, xviii, 48; *BUILDER Journal*, xii, 427, and xiv, 171; *BUILDING NEWS Journal*, iv, 1127. The provost's residence adjoining was erected after that designed by the earl of Burlington for General Wade in London, as given in CAMPBELL, *Vitruvius Britannicus*. Among the other educational establishments are the marine school, 1768-73, by T. Ivory, 130 ft. front, cost £6,600; the infirmary and dwelling, cir. 1816, by E. Parke; the Hibernian school Phoenix Park, 1769-70; the royal Irish academy, incorporated 1786; the royal Hibernian academy, incorporated 1803, occupies the house formerly the private residence of F. Johnston, esq., architect, 1824; the National Society's schools occupy Waterford house, cir. 1740-5, by R. Cassels, the first private edifice of stone erected in Dublin; the extensive reformatory of S. Vincent de Paul, 1858, by J. Bourke, is noticed in *BUILDER Journal*, xvi, 617; and the S. Columba college, additions 1852 by P. C. Hardwick of London, given in *CIVIL ENGINEER Journal*, xv, 281, estimated cost about £11,000. There are about two hundred charity schools; Maynooth college, ten miles distant from the city, was established in 1795.

Amongst the numerous guilds, the tailors' hall dates 1706-10; the linen hall, 1720-8, cost £3,000 for the first quadrangle, which has been increased by five others; and the weavers' hall, rebuilt 1745; and among the private residences may be noticed the small library at Charlemont house, by J. Gandon, though that and the house itself, of Arklow stone, are stated to be by Lord Charlemont (aided by Sir W. Chambers), whose casino at Marino near Dublin, cir. 1759, is by Sir W. Chambers; and Tyrone house, by Cassels, 1740, is 90 ft. frontage. There are about five or six large and very important business, or Scotch, houses as they are called. Kildare-street club, 1858-9, by Messrs. Deane and Woodward, is estimated at £21,750.

The Wellington monument in Phoenix Park, 1817, by Sir R. Smirke, R.A., of Wicklow granite, is 205 ft. high, 7 ft. square

at top and 14 ft. square at bottom of the shaft of the obelisk, which is 150 ft. high; although it cost £29,000 it has never been completed, the statue and bassi relievi, which were essential parts of the design, have not been made, so that there are three huge pedestals with nothing upon them; Nelson's pillar, 1808, by W. Wilkins, R.A., cost £6,856: 8: 3, its height to the top of the statue is 134 ft. 3 ins., the statue being 13 ft., the diameter of the column is 20 ft. at the base; a statue of George III in the exchange, was erected 1787; an equestrian statue of George I, 1720, but removed to its present place in 1798; another of George II, in S. Stephen's Green, 1758; one of William III, 1701, which was repaired and elevated 1765; and a statue of Moore the poet, by C. Moore, 1858.

The railway stations comprise the Dublin and Drogheda, 1843-4 (Italian), by W. D. Butler, cost £7,000, and is of granite from the quarries at Goldenhill, county of Wicklow, the frontage is 140 ft. long, and the centre campanile 90 ft. high; the Midland Great Western, 1846-7, by J. S. Mulvany, has a Grecian Ionic colonnade 280 ft. long, the passenger shed comprises two segmental iron roofs of 60 ft. span each, and 475 ft. long, by — Hemans, C.E.; some notes on the fall of the roof were read at the Institute of Civil Engineers, December 14, 1847; and on the pontoon bridge, completed 1847 by R. Mallet, C.E., costing £1275, was the subject of a paper read April 23, 1850: the Dublin and Wicklow, 1858-9, by G. Wilkinson, 129 ft. frontage, cost about £12,000, *BUILDING NEWS Journal*, iv, 214; the Great Southern and Western, 1845-6, by Sancton Wood of London; and the Dublin and Kingstown, 1833-4, by C. Vignoles, C.E.

The best edifices are architecturally illustrated in MALTON, *Pict. View of Dublin*, fol., London, 1704, 1792, and 1795; and in CASH, *Views*, 4to., 1780; BLACK, *Guide*, 8vo., Edinb., 1854; EXHIBITION GUIDE, 12mo., 1853; IRWIN, *Guide*, 12mo., 1857; STARRAT, *Hist. of Ancient and Modern Dublin*, 12mo. (1828?); WRIGHT, *Guide to Ancient and Modern Dublin*, 12mo., London, 1821, and 1825; with his *Ireland Illustrated*, 4to., London, 1829, 1831; HEATH, *Pict. Annual for 1837*; HARRIS, *History*, 8vo., 1766; TAYLOR, *The University*, 8vo., 1845; MASON, *Cathedral of S. Patrick*, 4to., 1819 and 1835; MACGLASHAN, *Dublin and its Environs*, 1853; HALL, *Dublin and Wicklow*, 1853; WARBURTON, WHITELOW, and WALSH, *History*, 2 vols. 4to., 1818; SCALE, *Elevation of the Parliament House*, 1767; BREWER, *Beauties of Ireland*, 8vo., London, 1826, 1829; GILBERT, *History*, 3 vols. 8vo., 1854-9; and CARPENTER, *Rest. of S. Patrick's*, fol., London, 1847.

*Means adopted for securing the Decayed Flooring and Partitions at Apothecaries' Hall*, by R. Mallet, is given in LONDON, *Arch. Mag.*, ii, 165. *Raising the Roof of S. George's Church*, read at Inst. of Civil Engineers, is given in the *CIVIL ENGINEER Journal*, iv, 285. A plan of the city is given in the maps of the Society for the Diffusion of Useful Knowledge, No. 174, and the environs No. 175. Revised by Mr. C. Papworth.

DUBOIS or Du Bois (PIERRE) designed and erected the hôtel de Megrigny; soon after 1637 the hôpital des Incurables, for cardinal François de Rochefoucault; and the maison du Séminaire de S. Sulpice, commenced 1647, at Paris: BRICE, *Nouveau Description*, 12mo., Paris, 1725, iii, 397, 414. 5.

DUBOIS (JEAN BAPTISTE), born at Arquennes 13 November 1762, resided at Termunde, built the pavillon at Haarlem for M. Henri Hope, from a design by Triqueti; and constructed a château at Wacsmunster in Eastern Flanders. GOETGHEBUER, *Choix*, fol., Ghent, 1827. 101.

DUBOIS (VICTOR) designed 1828 the house No. 9, boulevard S. Denis, and 1830 the farm buildings at Juvisy (Seine et Oise), respectively given in NORMAND, *Paris Moderne*, 4to., Paris, 1837, i, 92-3, and iii, 73-5. It is supposed that he died in 1850.

DUBRESSI ( . . . ) of Mons, with Gabi of Rijssel, rebuilt 1714 the buildings of the monastery of S. Guilain, six miles from Mons. BREUCK. 24.



DUBUISSON or Du Buisson ( . . . ), the father, designed about 1700 the remarkable church of two stories, that is to say one church above another, with a library in the roof, to the séminaire des missions étrangères in the rue du Bac at Paris, but the church was not commenced until long after the establishment, 1663, of the séminaire, and was finished a few years only before the time of BRICE, *Nouveau Descr.*, 12mo., Paris, 1725, iv, 24; who also mentions the son of this Dubuisson as the architect, 1714, of two houses on the neighbouring property of the institution.

DUC (GABRIEL LE) designed about 1630 at Paris, for the managers of the Hôtel-Dieu, according to BRICE, *Nouveau Descr.*, 12mo., Paris, 1725, iv, 46, a house, occupied afterward by the marquis de Galifé, in the rue S. Dominique, near the Jacobins, given in the GRAND MAROT, and in BLONDEL, *Arch. Franc.*, fol., Paris, 1752, i, 255; who also, *Cours*, 8vo., Paris, 1772, iii, 303, observes that Le Duc conducted the works of the church of the Val-de-Grâce, which (commenced 1645 by F. Mansard, and continued to the height of the lower cornice by J. Lemercier) were completed 1654-65 by P. Le Muet, who availed himself of the talents of Le Duc for the exterior, and of (Broutel, Sieur) Du Val for the interior, according to BRICE, iii, 109. But MARIETTE, in the edition of D'AVILER, *Cours*, 4to., Paris, 1760, p. 126, pl. 42, giving the details of the high altar and baldaquin in this church, ascribes the work to Le Duc; and is corroborated on this point in the *Arch. Franc.*, ii, 62-71; which latter publication, ii, 126, notices that Le Duc continued (probably after the death of Le Vau in 1670) the parish church of S. Louis in the Isle, which was completed 1726 by J. Doucet. BLONDEL, *Arch. Franc.*, iii, 21, and *Cours*, iii, 303, adds to the above that Le Duc continued or rather conducted the works of the church of the Augustins Déchaussés or of Petits Pères, near the place des Victoires, designed 1656 by Le Muet, after the elder Bruand had carried that edifice about seven feet above the level of the ground; the portal is by Cartaud, not by Artaud, as in the BIOC. UNIVERSELLE. Amongst the many houses which Le Duc erected at Paris were that of André Potier de Novion in the rue de la Planche, faubourg S. Germain (BRICE, iv, 27), and another on the quay beyond the porte S. Bernard, which seems to be that noticed by BRICE, ii, 364.

DUCA (GIACOMO DEL), a Sicilian by birth, and a pupil of M. A. Buonarroti, is chiefly commemorated by BAGLIONI, *Vite*, 4to., Naples, 1733, p. 51. He designed the lanternino to the cupola by G. di San Gallo, and probably the side doorways to the church by A. San Gallo of the Madonna di Loreto de' Fornari at Rome, given in FALDA, *Nuovo Teatro*, fol., Rome, 1686; the balcony (*ringhiera*) and front central window, as well as the ceiling (*soffitto*) of the prima sala, in the palazzo de' Conservatori in the piazza del Campidoglio; and the niche for the statue of pope Gregory XIII in the sala del Senatore. He also designed 1575 the palazzo Cornari, near the fontana di Trevi, given in FERRERIO, *Palazzi di Roma*, fol., Florence, n.d.; the church de' Crociferi in that neighbourhood; and 1582 restored the interior of the church of Sta. Maria Imperatrice, adding externally the portal which faces the road to S. Giovanni Laterano, as well as designing the city gate near the last named edifice. Besides working to a considerable extent for the cardinal Alessandro Farnese, especially at Caprarola, he designed the gardens of the palazzo Mattei alla Navicella, given in FALDA, *Giardini*; of the palazzo Strozzi on Monte Mario; and of the residence of cardinal Pio behind the basilica of Constantine or so-called temple of Peace. He was assassinated soon after his return to Palermo, of which city he had been made chief engineer. 38.

DUCCIO ( . . . ) erected 1376 the chapel of the Virgin to the palazzo publico at Siena, according to GRANDJEAN and FAMIN, *Arch. Toscane*, fol., Paris, 1846, pl. 103.

DUCERCEAU, see CERCEAU ( . . . DU).

DUCHESSE SLATE. The name given to one of the larger

slates, its size being 24 ins. by 12 ins.; a thousand of which will cover about ten squares, and weigh about three tons. There is also a smaller size, 22 ins. by 12 ins.

DUCK HOUSE. The place in which ducks are kept; it should be placed in some dry and warm situation convenient to the homestead or house; not close to the water, nor very far from it. The floor of wood should be raised not less than 3 ins. from the ground; the divisions between the nests, which should be 1 ft. 6 ins. by 2 ft. 6 ins. in size, and the sleeping compartments, which should be larger according to the number of ducks kept, should be of stone, slate, or brick, well and often limewhitened; the roofs over the several compartments require similar treatment. The compartments should have large doors to enable the ducks readily to be driven into them at night, each having an inclined plane of wood up which they can walk. Duck houses should never be placed close to water where there is much grass, for many ducklings are killed by rats and cold, and are frequently destroyed during heavy rains, in the long grass; a gravel path sloping into the water is desirable. Ducks, and especially young ones, should be housed at night and kept shut up until the morning. Geese require the same kind of house and treatment.

A. H. M.

The Roman duck house according to VARRO, iii, 11, and COLUMELLA, viii, 15, was used also for other birds which feed in pools and swamps, and was more expensive than the goose house. A flat piece of ground, marshy if possible, was surrounded by a wall 15 ft. high, plastered on both sides; and along this wall a series of covered nests were formed of hewn stone upon an elevated ledge: the whole open space being covered with a net or with trellis work. A small canal of running water traversing this enclosure, passed through a shallow central pond, with a margin formed of *opus signinum*; and surrounded by shrubs. No such trouble is taken with these birds at present, a series of nests in a barn being all that is afforded even where a considerable number of them is kept; although even LOUDON, *Encyc. Agric.*, 8vo., London, 1831, p. 1091, quoting MOWBRAY, *Practical Treatise*, 8vo., 1815, reasonably observes that it would be preferable to separate entirely the aquatic from the other poultry; the former to have their houses ranged along the banks of a piece of water, with a fence, and sufficiently capacious walks in front; access to the water by doors, to be closed at will.

DUERNSTETTER (HEINRICH) was werkmeister in 1399 to the cathedral at Ratisbon. 92.

DUFART ( . . . ), who died 1819, designed several buildings at Bordeaux, inclusive of the théâtre Française or des Variétés, opened 29 November 1800. His plan for the arrangement of the promenade des Quinconces and its vicinity has been engraved. BERNADAU, *Biographie*, 8vo., Bordeaux, 1844, p. 100; and *Hist. de Bordeaux*, 8vo., 1839, p. 382.

DUFFIELD BANK QUARRY. The stone obtained from this quarry, situate at Duffield in Derbyshire, is a sandstone, composed of quartz grains of moderate size, and decomposed felspar, with an argillo-siliceous cement, ferruginous spots, and occasionally plates of mica: its colour is a light brown with dark brown and purplish tints. The thickest beds are about 4 ft.; half the depth being brown, and half white. It has been used in S. Mary's bridge, the Reporter office, Mechanics' lecture hall, bishop Ryder's church, and dressings and tracery of S. Paul's church, all at Derby; the bridge at Duffield, and the chimney shafts to the grammar school at Birmingham: *Report of Commissioners on Building Stones*, etc.

DUFOUR (ALEXANDRE), born about 1760, studied at Rome, and on his return to France was made architecte du roi, and chevalier of the Legion of Honour; he directed all the works executed at Versailles from 1810 till 1835, when he died at the age of 75 years. 68.

DUFOURNY (LÉON), after studying for fifteen years in Italy and Sicily, in which island he designed (probably for Palermo) a botanical school, returned to Paris with a collection

of models of the most esteemed ancient buildings in those countries, which was purchased by the government. He also became professor in the école des Beaux Arts, as successor to D. Leroy, and a member of the Institute. After erecting several public and private edifices, he died 1818, being about fifty-eight years of age; and was succeeded by Baltard in the offices of architecte des prisons, des halles et marchés, et de Bicêtre. 68.

DUGGA, see THUGGA.

DUIVENE or DULVENE (PETRUS JESAIAS), born at Amsterdam in April 1760, died there in Jan. 1801. He designed 1795, a house for the baron van Wykerlooth van Grevenmachern, otherwise for the baron von Frankenstein in the Haarlemmer-Hout, given in GOETGHEBUER, *Choix de Mons.*, fol., Ghent, 1827, pl. 70. He translated into Dutch the work on architecture by LE CLERC, 4 vols., 4to., Amsterdam, 1781, with 182 plates engraved by himself; and also wrote a *Handboek voor Kunst en Ambachten*, published at Dordrecht. 24. 101.

DUKERS (FRANÇOIS JOSEPH AUGUSTE), junior, born at Liège 15 December 1792, was a pupil of Percier at Paris. His design submitted in competition for the theatre at Liège was successful, and illustrations, with plans, etc., of the building, erected 1818-20, are given in GOETGHEBUER, *Choix*, fol., Ghent, 1827, p. 59, pl. 87-9.

DUKE'S QUARRIES, near Holt Stanwell bridge, Derbyshire, supply sandstone composed of quartz grains generally coarse, with decomposed felspar, and an argillo-siliceous cement, and ferruginous spots. The colour is red, varied with green, brown, and grey. It has been employed at the penitentiary at Millbank, Westminster; in the filling in of parts of Waterloo bridge, London; and for the bulk of the stonework of the water gate entrances of the Victoria docks, completed 1859. *Report of Commissioners on Building Stones*, etc.

DUKKEY. A village situate above Kalabshe, in Nubia. The front of the temple close to the river faces the north, and consists of two pyramidal moles with a gateway complete; a cornice and torus surrounds the whole. The dimensions of the front are about 75 ft. in length, 40 ft. in height, and 15 ft. in depth. The walls are without hieroglyphics. In the cornice over the gateway is the winged globe. In each of the moles, in the inside front, are small doorways ornamented in a similar manner, leading by a stone staircase to small chambers, and to the top. A court of about 40 ft. in depth separates the moles from a pyramidal portico, in which are two columns engaged half their height in a wall elevated in the centre forming the entrance. The depth of the portico is about 18 ft.; the ceiling is almost perfect, composed of single stones reaching from the front to the back part:—a lateral wall divides the portico from three inner chambers; the ceilings of these are imperfect. —The whole was surrounded by a wall extending from the two extremes of the moles. WALPOLE, *Memoirs*, 4to., London, 1817, p. 409.

DULICHIO (BUSCHETTO DA), see BUSKETUS.

DULIN or DULLIN ( . . . ) erected about 1704 the house of M. Sonning, afterwards the hôtel de Fontferrière, altered 1740 by Tannevot, in the rue de Richelieu at Paris, given in BLONDEL, *Arch. Française*, fol., Paris, 1752, iii, 87; the house of M. Dunoyer (1708, according to BRICE, ii, 274) at the end of the rue de la Roquette, faubourg S. Antoine, given in the same work, ii, 135; and the house of M. Galpin at Auteuil, according to the same author, i, 215; and about 1730 the hôtel de Lambert in the rue de l'Université, given in that work, i, 263. He was engaged in the completion, restoration, alteration, and embellishment of several important private buildings, such as the hôtel d'Etampes, afterwards de Rohan, in the rue de Varennes, given in *Arch. Fran.*, i, 215; the hôtel de Jabac or Jabracq, built by Bullet, in the rue neuve S. Merri, BRICE, *Nouveau Descr.*, 12mo., Paris, 1725, ii, 64, 68, who also, i, 342, specifies great repairs, 1709, to the hôtel de Nevers in the rue de Richelieu, afterwards altered, 1719-20, for Law's banking-

ARCH. PUB. SOC.

house. In 1725 he was one of the members of the second class of the Academy of Architecture in Paris.

Under the name of Dulin, a son-in-law of Contant, the architect engaged in the construction of the Madeleine, Beaumont and Montaiglon published their protest against Contant's deviations from the original design.

DUMONT (GABRIEL PIERRE MARTIN), hon. member of the academies at Rome (1746), Florence, and Bologna, was born at Paris about 1720. After studying in Italy he returned about 1755 to France, where he became professor in the école royale des Ponts et Chaussées. He published, from drawings by Soufflot, *Vues et détails*, in seven plates, fol., Paris, 1764, which were repeated in MAJOR, *Ruins of Pæstum*, fol., London, 1768, and in a French translation of that book, 1769, by J. de Varennes: this is often ascribed to Dumont, whose great work is the *Recueil de plusieurs parties de l'architecture sacrée et profane*, fol., Paris, 1767, with more than 230 plates. It has his portrait by Kucharski, and seems to have been published in portions, each of which was devoted to a particular subject. It includes the *Détails, etc., de S. Pierre à Rome*, in 100 pl.; and the *Parallèle des plus belles salles de spectacles publiques*, in 54 or 60 pl.; with a *Suite de projets détaillés de salles de spectacles particulières*, in 54 pl.: from this SAUNDERS seems to have drawn his plans; and TREDDGOLD appears to be indebted to part of the rest of the work for some of his examples of roofing. Dumont was alive in 1790; the period of his death is uncertain. 83.

DUMOT, called TOMON in PUSHKAREV, *Opisanie*, 8vo., S. Petersb., 1839, iii, 120 ( . . . ), a native of France, built 1802 the grand, imperial, or Bolshoi, theatre, on the square so called, between the Moika and Catherina canals at S. Petersburg, of which only the original front with a portico remained, the body of the edifice having been rebuilt after a fire 1811, by Mauduit: GRANVILLE, *Guide*, 8vo., London, 1835, ii, 369.

DUN, DON, DOWN, DUIN, and DUNE. These words are frequently translated in Scottish topographical works as a hill; and also as the Gaelic name for a fort, given by the Highlanders of the west of Scotland to the sort of structure which is also sometimes called a brough, burgh, or by contraction bur, and a Pict's house, as well as a Danish or a Norwegian fort. Such structures are found in the Shetland, Orkney, and Western Islands, and in the counties of Caithness, Sutherland, Ross, Inverness, and Argyle, if not still further south, in Scotland. The most primitive variety is perhaps that which is subterraneous, and resembles to a great extent the polycameral CELTIC works; to this probably succeeded the similar construction, above ground, covered by a tumulus, and frequently called a cairn or carn; it has been proposed to confine the term Pict's house to these classes of such works. A higher degree of civilization is shown in the simple dun, which is a vaulted or pseudo-vaulted circular room, with niches in its one thick wall. Later still in date, it may be supposed, and larger, is the dun having two concentric walls about 2 ft. apart, with sometimes a staircase between them; the walls being either perpendicular, or having a tendency in one or both of them to meet at the top. The next kind, generally called a burgh, is of similar character to that last described, but is larger, and surrounded by a ditch and by a sort of rampart. Such works are so numerous, that the looseness of description which prevails with regard to them is to be regretted. The best accounts respecting their date, use, position, materials, size, etc., will be found in PENNANT, *Tour*, 4to., London, 1790, i, 338, ii, 206, 251, 337-415; CORDNER, *Antiquities*, 4to., London, 1780, pp. 49, 58, 74-83, 105-18; and *Remarkable Ruins*, 4to., London, 1795, p. 75; POPE, *Description*, and ANDERSON, *Account*, in the *ARCHÆOLOGIA*, 1779, v, 216 and 241; and THOMAS, *Celtic Antiquities of Orkney*, in the same work, 1852, xxxiv, 118; BARRY, *History of the Orkney Islands*, 4to., London, 1808; KING, *Munimenta Antiqua*, fol., London, 1804, iii, 188; and FORSYTH, *Beauties of Scotland*, 8vo., Edin., 1805-



8, ii, 13, 92-7, iii, 114-9, iv, 329, 504, v, 15-8, 73-8, 140, 169, 246-65, 361, 446, 476, 507. RHIND, *Notice of the Exploration of a Pic's House at Kettleburn*, in the *ARCHAEOLOGICAL JOURNAL*, 1853, x, 215, mentions the existence of a well in this, as in other cases.

DUNBLANE, commonly written DUMBLANE. A small market town, formerly an episcopal city, in the county of Perth in Scotland. The one principal and several smaller streets are all narrow and lined with houses that are mostly thatched. It is still, however, interesting for the remains of a cathedral dedicated to S. Blane; the choir, which has no aisles, serves as the parish church, and is 80 ft. long by 30 ft. wide; there were no transepts; the nave is 130 ft. long by 58 ft. wide (FORSYTH, *Beauties*, 8vo., Edin., 1805-8, iv, 301, says 76 ft., with walls 50 ft. high); the tower is at the east end of the south aisle. The date of erection may be 1142, but the buildings exhibit the transition from First into Second Pointed work. Part of the stalls has been preserved, and is shown, with four views of the building, in BILLINGS, *Baronial, etc., Antiquities*, fol., London, 1848, ii.

DUNDEE STONE. One of the best and most celebrated stone quarries in Scotland, is situate on the estate of Milnfield or Mylnfield, upon the river Tay, at the south-east corner of the county of Perth. This Kingoodie stone, as it is also called, is of a purplish grey colour, difficult to work, hard, and durable. "The steeple of Dundee, which was built of it in king David II's time, has scarce shown any symptom of decay, except where the influence of the town's atmosphere reaches: Castle Huntly, supposed to be built 1452, has scarce a stone in it which has yielded to the influence of the weather; and a gate at that place, built — a hundred and thirty-nine years ago (1667), is crowned with four pyramids, the points of which appear perfectly entire at this day, not measuring more in diameter than one-sixteenth of an inch.—It produces stones of all sizes, and for every purpose of building, as it affords blocks of 50 ft. in length by 16 ft. in breadth; also stones for pavements, millstones, slates, etc. In this quarry some stone is raised of a bluish cast, of an exceedingly fine grain, and capable of a polish little short of some marble. The deeper in the quarry the stone is, the better; it is soft below water mark, and it is easier worked, but it hardens in the common air. The best stone in this quarry seems to lay in a north-easterly direction; but as its bed proceeds north and west it degenerates, at least it appears so.—About a mile westward, below Langforgran, it has the appearance of a reddish granite; but it is soft, and seems to yield to the hammer, and dissolves so entirely with friction and moisture, that it has been found totally unfit for metalling roads; but it has been used, and does very well, for building common village houses. Farther west it has more of that red colour, and becomes heavy:" FORSYTH, *Beauties*, etc., 8vo., Edinburgh, 1805, iv, 268.

The red sandstone of Kingoodie was used in the upper part of the Bell Rock lighthouse in 1811. The *Report* of the Commissioners on Building Stones, etc., also mentions the royal asylums at Dundee and at Perth; Kinfauns castle, etc.; and describes the stone as having fine siliceous grains with a calcareo-argillo-siliceous cementing, micaceous in planes of beds; and to be obtained of any practicable size. The stone used for the works at Dundee harbour has been obtained from the PYOTRYES QUARRY, Forfarshire.

DUNDRY QUARRIES are situate near Bristol in Somersetshire. The stone is of marine origin, and forms part of the lower oolitic rocks, resting immediately upon lias. It seems to be a good shelly oolite of a light brown colour, with a slight appearance of lamination or sand beds. The component parts are almost entirely carbonate of lime, in the form of ova and small fragments of shells; the interstices generally contain a sort of earthy ochre (iron alumina), in a powdery, loose, incoherent state; with this exception, the stone is firmly consolidated into a mass, with a strong calcareous cement.

There are several very extensive quarries, in the immediate

neighbourhood of each other, on Dundry-hill; some open, others subterranean; and judging from the inequality of surface, which is now covered with vegetation, including many large trees, no doubt immense quantities of stone have been obtained in this district from a remote period. The quarries are covered with a head of earth and thin rubbly limestone, averaging from 6 to 12 ft. in thickness; there are several beds which are nearly level; in some places the corresponding beds are inclined to the horizon at an angle of 20 or 30°. The beds vary from 1 to 3 ft. in thickness; the joints are irregular, but large stones may be obtained from all the beds, even from those near the surface of the ground, large enough for all architectural and general building purposes. There does not appear to be any important difference in the quality of the various beds; some are rather more coarse and shelly than others, but in all oolitic limestone rocks, similar to those at Dundry, the most durable stone is obtained from the uppermost beds; they are sometimes too coarse for minute work, but the finest grained stone of the oolitic series will seldom resist weather, in exposed situations, so well as the coarser and more shelly kind. The coarsest varieties of Dundry stone resemble in many respects the stone which is obtained from Ranville, near Caen, in Normandy, and which appears to stand wind and water amazingly well. The weight of a cubic foot of Dundry stone in its ordinary state is 126 lbs. 2 oz.; when thoroughly wet, 134 lbs. 14 oz.; when dry, 124 lbs. 5 oz.; and a cubic foot of the stone will absorb 10 lbs. 9 oz. of water, which is by measure rather more than a gallon in the foot.

Across the beds of this stone, something like an irregularly laminated formation may be observed; consequently it may be imagined that it is important to place this stone on its natural bed; but in the buildings hereafter mentioned, many instances may be seen where the stone has been long exposed to the weather, in a vertical position, without any appearance of exfoliation or decay on one surface more than another, therefore it may probably be safely used in any way, without reference to its position in the quarry.

The Dundry stone appears to have been the principal material used for building purposes in the neighbourhood of the quarries during a long period. In the dwelling houses, boundary walls, and other buildings throughout the village, which have unquestionably been constructed, many years since, with stone from quarries in the vicinity, scarcely a trace of decay is visible, although evidently used without judgment or selection. The masonry of the poor-house, not less than two centuries old, is in excellent condition. In the churchyard, a large cubical block of stone, measuring 4 ft. 6 ins. by 4 ft. 6 ins., and 3 ft. 6 ins. high, weighing about four tons, probably used by our ancestors as a pay table, is as free from decay as when first placed there. The remains of an ancient cross, considerably ornamented, are in fine preservation. Dundry church was erected during the thirteenth century: the tower, of about the fifteenth century (1482), is in parts minutely elaborated, and nearly covered with lichens. It is surmounted with clustered pinnacles and battlements, perforated so as to present an exceedingly light and delicate appearance, more like metal-work than masonry. Inscriptions on these open parapets and turrets show that some were repaired in 1632, others in 1827. A few of the stones are harder and more shelly than others; but all seem to be of the same mineralogical character, and present the same weathered appearance, as if likely to last for ages. Viewing this structure collectively, it may be considered a satisfactory example of the durability of stone from some of the neighbouring quarries; for although the building is slightly decayed in some parts, it is nearly perfect in others. It is generally supposed that the church of S. Mary Redcliff, at Bristol, was constructed with Dundry stone; but although the two buildings are about the same age, the stone of one is comparatively perfect; whereas that of the other is in so decayed a state as to require restoration. It is nearly certain that the church of Dundry is built

with Dundry stone, but the church at Redcliff appears built with a very different, and certainly a very inferior, material. Report by Mr. C. H. SMITH.

An elevation of the Dundry tower is given in the *ARCHITECT Journal*, i, 198-201, 217; and a view in the *BUILDER Journal*, viii, 1850, 211, from a plate prepared for WICKES, *Spires*, etc., fol., London, 1853.

DUNELMENSIS, see DURHAM (ALDHUN OF).

DUNGEON. This term, now usually appropriated to a cell in a prison, evidently received that meaning from the fact that the lower story of the keep (Fr. *donjon*) of the mediæval castles was used as a place for the confinement of prisoners. The French word is derived from the late Latin terms *domicilium* and *dominionus*, as being the dwelling of a superior, according to SAUVAL, *Hist.*, fol., Paris, 1724, ii, 273; while DUCANGE, *Gloss. s. v.*, calls dunjo a petty castle, a small fort, built 'in duno seu colle', whence he derives the name donjon. The earliest mediæval castles were simply a tower on a motte or moat (the dune or little hill), and after it had become customary to place other buildings and fortifications around it, the point at which the besieged would naturally make the last effort of defence would be the keep or donjon, which last word retained a place in the French dictionaries of military engineering as the strong point, in a fortification, to which the besieged resort before capitulation. MOAT.

DUNGEON. This term is also commonly used for a cellar, or a place like a cellar, used as a prison. Thus PENNANT, *Tour*, 4to., London, 1790, ii, 52, describes on "each side of the inner gate at Cockermouth, in two deep dungeons, capable of holding fifty persons in either; they are vaulted at top, and have only a small opening in order to lower through it the prisoners; and on the outside of each is a narrow slit with a slope from it; and down this were shot the provisions."

DUNJAY WOOD, from Sierra Leone, possesses the property of resisting the worm, when used in shipping. It is rather coarser in the grain, but harder in substance, than Spanish Bay mahogany. CORRY, *Coast of Africa*, 4to., London, 1807, p. 55.

DUNKELD. A market town and old episcopal city in the county of Perth in Scotland. The remains of the cathedral, 120 ft. long and 60 ft. wide, comprise the choir, which is fitted up as a parish church; at the west end is a large tower 90 ft. high, and adjoining it a small octagonal watch tower. The structure was built of a very fine grained freestone, of a light vivid ash-colour, and so hard as to have resisted for centuries the injuries of the weather; it is said to have been procured from a quarry in the parish of Little Dunkeld; FORSYTH, *Beauties*, 8vo., Edinburgh, 1805. The foundation 1127, the nave refounded 1406, completed 1450-69, in which last year the belfry was begun, are dates given by BILLINGS, *Baronial, etc., Antiquities*, fol., London, 1848, ii: other authorities state that the choir was built 1330; the aisle 1450; the chapter-house 1469; and the tower 1501. Near the cathedral is the old fashioned square mansion of the duke of Athol; and a new one partly completed 1830 is by H. E. Goodridge of Bath. In the grounds are the two first larches introduced (from the Tyrol, 1738) into Britain, one being now 90 ft. high, and measuring about 5 ft. in diameter at two feet from the ground. 50.

DUODECASTYLE. The term adopted for a rank of twelve columns or pillars facing the spectator: such as the portico placed by Inigo Jones in front of old S. Paul's cathedral, London.

DUOMO. This term in Italy, like *dom* in Germany, is applied to a cathedral church as being emphatically the house, domus Dei; at least this is preferred, for the origin of the two words, to *doma*, *duom*, *tuom*, and *thuomo*, by ADELUNG, *Versuch*, 4to., Leipzig, 1774, s. v. dom.

DUPERAC (ESTIENNE), sometimes called DU PERAC. The scanty notices respecting Duperac are so contradictory, that there is a possibility that the lives of two persons of the same name may have furnished the materials for the account that is

generally given of one architect. Thus some writers name Bordeaux, others Paris, as his birthplace, in years ranging between 1540 and 1570. NAGLER, *Diz.*, states that Duperac published a collection of forty etchings of ruins, etc.; the title was *I vestigi dell' antichità di Roma raccolti et ritratti in prospettiva con ogni diligenza da Stefano du Perac Parisino*, 1573, 1621, 1625, and 1680; this is the same work as *Le cospice e meravigliose fabbriche degli antichi Romani hoggi ridotte in Rovine disegnate e pubblicate con privilegio del Sommo Pontifice l'anno 1575 da Stefano Duparac Parigino*; a reprint 1700, with notes by G. G. Rossi. NAGLER notices the reprint of 1773: the plates are not good even for that time, but appear to be trustworthy representations of the then condition of the buildings. NAGLER also gives a list of twenty-eight other works by Duperac, all of them being dated between 1564 and 1581 except *La Festa di Testaccio in Roma*, which bears the date 1534, held by NAGLER without giving any reason to be an error. Among this number of plates it is worth noticing that entitled *Il sontuosiss. et Ameniss. palazzo et giardini di Tivoli*, which is dedicated to Catherine de Medicis, and is said by Duperac to have been made by order of the emperor Maximilian; he dates it from Rome 8 April 1573, and signs it Stefano Duperac Parigiano.

NAGLER gives no earlier date to the following plate than 1581; the *Catalogue des Bibliothèques de la Marine et des Colonies*, 8vo., Paris, 1838, mentions, 3101, *Stephanus Duparac, Claudii et Trajani Imp. admirabilium portuum ostensium orthographia juxta antiqua vestigia accuratissime delineata*, published by Lafrez at Rome, 1575, in one sheet.

These titles have been given at length, in order to show the manner in which Duperac wrote his own name, and in which CLARAC, *Musée du Louvre*, 8vo., Paris, 1841, i, 359 and 651, is to be distrusted. In positive opposition to this author, CAULET, *Notice*, 8vo., Paris, 1843, p. 13, 110-7, says, apparently on the authority of a note by Estienne Duchesne, prévôt des bâtiments du roi, to an engraved view of the gallery, that in 1595 Duperac was charged with the construction of the pavillon de Flore, and of the gallery of the Louvre; that Henri IV gave Bullant in 1596 the commission for the construction of the five bays of the great gallery of the Louvre, next to the pavillon de Flore, which had previously been entrusted for execution to Duperac; and that these works were not finished by Bullant, but that after his retirement to Ecouen, where he died 1598, and at the death of Duperac 1601, they were completed by Jean B. du Cerceau the son. BLONDEL, *Arch. Franç.*, fol., Paris, 1752, iv, 19, 71, 87, says that Duperac enlarged the Tuileries, and did so much of the gallery as reaches from the centre wicket to the pavilion designed by J. A. du Cerceau at the angle of the Tuileries: while BRICE, *Nouveau Description*, 12mo., Paris, 1725, i, 154-8, states that (although unfinished at the time of writing) the gallery, from the Louvre to the first wicket dates in the reign of Charles IX, 1560-74, and that from the great corner pavilion (of the Tuileries) opposite the pont-royal to the first passage are double pilasters of a Composite order, by Estienne du Perrac, the eight last of them, next the passage, having  $\propto$  instead of a rose in the capitals, which shows that this portion was built under Henry IV about 1593. Whether under Henry III (1574-89) or under Henry IV (1589-1610) is immaterial to the fact here stated, if that could be considered satisfactorily established, because the same author, p. 157, attributes the portion (half) of the gallery next to the Louvre to Louis XIII (1610-43) as the work of Metzeau. Duperac is said to have died about 1601, aged 32, by BALDINUCCI, ii, 4, 275.

DUQUESNEY (FRANÇOIS ALEXANDRE), a pupil of Percier, obtained one of the prizes offered in competition for designs for the palais de justice and prisons at Lille; was inspector of the restorations, 1825, of the Sorbonne at Paris, where he was architect to the école des Mines, and erected several edifices inclusive of the terminus of the Paris and Strasbourg railway. He died at the end of 1849. *ARCHITECT Journal*, i, 538. 110.



DURAN (DON RAMON), born at Madrid, 7 April, 1760, was one of the best pupils of Ventura Rodriguez. He became, 5 September 1784, a member of the academy of S. Fernando, and subsequently was appointed deputy director of the *policia* of Madrid, in which capacity he directed the drainage then in hand; architect to the national bank of S. Carlos, for which he made several alterations in its offices, and for which he also executed several works to the canal de Manzanares; and master of the works to the hermandad del Refugio, to the hospital de la Latina, and to several monasteries. His first design was that of the house 217 in the calle del Principe for the conde de Torrepilares; this was succeeded by the church and palace of the abadia at Magacela in Estramadura, for the tribunal called consejo de Ordenes; and by the renovation of the monastery de S. Spiritus as well as of that of the colegio of Alcantara, both at Salamanca. He also designed the country house of the conde de Campo de Alange at Carabanchel de Arriba; and a house, 306, in the calle de las Infantas at Madrid: this was incomplete at his death, 10 October 1797. 66.

DURAND (CHARLES ETIENNE), born 29 November 1762 or 1763 at Montpellier, was appointed so early as 1781 professor of architecture to the province of Languedoc, and became inspecteur des travaux, 1 January 1788, whereupon he was entrusted with several considerable works, inclusive of the pont de Ners over the river Gardon. He became a member of the corps des ponts-et-chaussées, and directed during twenty-five years the operations necessary in the arrondissement de Nîmes, inclusive of the causeway, 1812, between Beaucaire and Tarascon. At Nîmes he restored the maison carrée, and part of the amphitheatre, erected the palais de justice, and reconstructed 1811 the general hospital. He also designed the Protestant churches at Vauvert and Calvisson, and other places of worship. With Grangent and Durant he published a *Description des Monumens Antiques du midi de la France*, fol., Paris, 1819, with forty-two plates. He resigned his appointment 1 May 1821, and died at Nîmes 26 August 1840. 83.

DURAND (JEAN NICOLAS LOUIS), born at Paris 18 September 1760, was the son of a shoemaker. Placed early in the workshop of a sculptor, he showed such inclination for architecture that a friend placed him as a pupil with Panseron, where he worked so well that he opened at fifteen years of age a school of geometrical drawing: at sixteen years old he went to Bouleé. He obtained 1780 the *second prix* for a design for a collège on an equilateral triangular site, engraved in the *Collection* by PRIEUR; built 1788 the maison la Thuile in the rue du Faubourg Poissonnière, given in his *Leçons*, and in LEGRAND and LONDON, *Descr.*, 8vo., Paris, 1809, ii, 209. In 1793 he submitted eleven designs, in partnership with Thibaut, at the government competition for public monuments, and they obtained four prizes, the designs for which are given in the *Collection* by DESTOURNELLES. The following year he was made professor in the école polytechnique; and 5 January 1820 a member of the legion of honour. He published the well known work *Recueil et parallèle des édifices*, fol., Paris, 1800, with 91 plates, the text, which was by J. G. Legrand, being issued separately as *Essai sur l'histoire générale de l'architecture*, 8vo., Paris, 1809 (of the whole, with three hundred additions, there was an edition, fol., Venice, 1833); the *Précis des leçons*, etc., *données à l'école polytechnique*, 4to., Paris, 1801-5, and as the *Nouveau précis*, 1813-7, and 1820-5 with 64 plates; and the *Partie graphique des cours*, 34 plates, 4to., Paris, 1821, which was the third part of the *Précis*. The *Cours* was published with the title *Abriss der Vorlesungen über Baukunst*, at Freiburg, 1831. He died 31 December 1834, at Thiais near Paris; and a memoir by one of his pupils, A. J. B. RONDELET, appeared in the *JOURNAL DES LETTRES*, etc., 1835, i, 101: another notice, in the *MONITEUR*, 6 January 1835, has been reprinted.

LOUDON, *Arch. Mag.*, 8vo., London, 1835, iv, 353, states that he died 31 December 1834; but in 1837, ii, 284, he gives the date 1 January 1835, aged seventy-five, at Thiais near Choisy-

le-roi; and this latter circumstance seems to point him out as the late L. Durand, whose designs for a house 1816 at Chessy near Lagny; 1820 at Thiais; and again 1825 at Thiais, are given respectively in NORMAND, *Paris Moderne*, 4to., Paris, 1837, i, pl. 14-5, 143; iii, 46-8. 83.

DURAND (DOM LEOPOLD), born 29 November 1666 at S. Mihiel in Lorraine, was at first an advocate at Metz and at Paris, but took the Benedictine habit at the abbey of Munster in Alsace, 11 February 1701. He designed the abbeys of S. Evre at Toul, of Epternach in Luxembourg, of Moyen-Moustier, and of S. Avold; the priory of Châtenoy; and the château of Commercy. He died at S. Avold, 5 November 1749, leaving a large quantity of drawings, besides the materials for his many publications, enumerated by CALMET, *Bibl. Lorraine*, fol., Nancy, 1751. 83.

DURAND (NICOLAS), born at Paris 28 November 1738, built at Châlons-sur-Marne 1758 the hôtel de la Préfecture; and 1769 the porte Dauphine; and at Langres 1772 the hôtel de ville, and 1774 the hôtel Dieu and the Dominican monastery, praised as the best works in France, by WIEBEKING, *Baukunde*, 4to., Munich, 1826, iii, 145, who visited Durand in 1824 at Châlons.

DURANDUS. This is the name now assigned to the architect of the cathedral at Rouen, DURANDUS ME FECIT being cut on a boss representing the Paschal Lamb; DEVILLE, *Révue*, 8vo., Rouen, 1848, p. 13, considers that this was the first and earliest of the bosses, because it belonged to the last (next the tower?) bay of the nave, that all the bosses were from one hand, and that this hand was that of an architect, not merely of a sculptor, engaged there 1214-51. The boss was noticed by the COMITÉ HISTORIQUE, *Bulletin*, 8vo., Paris, 1842-3, p. 306, and was afterwards in the musée at Rouen, but has perhaps been replaced.

DURANGO, see LOPEZ DURANGO (EUGENIE).

DURANT (GEORGE), a general officer, rebuilt after 1762, for himself, Tong Castle in Shropshire, in the 'Gothic' manner of the time: NEALE, *Views*, 4to., London, 1825, 2nd series, ii.

DURDHAM DOWN STONE. A limestone obtained near Bristol, from quarries formed in the banks of the river Avon. Many of the houses in Clifton are built with it; but it is seldom used except for rubble walling, as it retains moisture. It makes very good lime for plastering, and also an excellent road stone. In the same quarries is found the so-called BRISTOL MARBLE. T. S. P.

Stone from the white quarry is composed of 99.5 parts of carbonate of lime, .3 bituminous matter, and .2 earthy matter: Bristol Durdham Down white lime is composed of 99.6 of carbonate of lime .2 bituminous matter, and .2 earthy matter and oxide of iron: and the stone producing the very white lime for plasterers is composed of 99.7 carbonate of lime, .1 bituminous matter, and .2 oxide of iron and earthy matter. Thus this limestone may be considered equal, or even superior, to the Travertine in purity: *First Report of Commissioners on the Fine Arts*, fol., London, 1842, 41.

DUREN (ADAM VAN), it is reported, went 1513 from Utrecht to Lund in Matmö in Sweden to repair its cathedral, consecrated 1 September 1145, especially the north aisle, and was still at work in 1527. The repairs were made in the then predominant ogival style, and to which he added some allegorical sculptures. BRUNIVS, *Beskrifning*, 8vo., Lund, 1836, p. 188-213. 24.

DURHAM. The capital of the county of Durham in England, until lately a county palatine, is situated on the river Wear which almost insulates the city. It has two stone bridges; Framwellgate, or the old bridge, 1099-1128 (perhaps the oldest in England), is a very remarkable specimen of construction; it consists of two segmental ribbed arches, one 82 ft., the other 87 ft., span, with a rise of one quarter, and 250 ft. in length: it was to be widened 8 ft. 1859-60. The form, particularly of the westernmost of the arches, having the appearance of a parabola,

was measured by ordinates when the river was frozen over, and found to resemble that curve very closely, the two sides being somewhat flattened as is supposed from the yielding of the centre when the arch was being built. Elvet, or the new bridge, about 1170, has nine small pointed arches mostly ribbed; in 1806 it was widened to twice its former width. The Prebends, or 'new' bridge, is out of the town beyond the extreme south-west end of the Bailey (ballium); it was built 1772-7, by G. Nicholson, to supply the place of a former bridge which with many others was destroyed by the great flood of 1770; it consists of three semicircular arches. Shincliffe bridge, on the same river, one mile from the city, was rebuilt 1824-1825, it being found impossible to widen the old bridge whose foundations rested upon a frame above the river bed which had been scoured away. The present bridge consists of two very flat elliptical arches.

Considerable remains of the old city walls may be traced, and a circular bastion still exists which was formerly connected with the old gaol and its tower and gate, removed when the new county prisons were built. An archway, called the Water-gate, through the Bailey wall leading to the Prebends bridge, stands on the site of a former postern. The college gateway, 1494-1519, leading to the abbey or cathedral and into the college or quadrangle containing the residences of the dean and chapter, is the only one now remaining besides the clock-tower gateway under a Norman groined arch giving access to the castle. The city is lighted with gas and well paved.

The castle dates from 1070, of which period some elaborate doorways remain; likewise some arched window-heads to be seen within the building, the exterior modern casing hiding them from without; besides a remarkable crypt chapel; all in the northern portion of the structure. They are given by BILLINGS. The great hall, 101 ft. 6 ins. long by 35 ft. 3 ins. wide, forms the west side of the castle court; within the hall at its south-west corner is a projection in the form of a large plain stone pulpit called the music gallery where musicians were stationed to sound a flourish of trumpets on public occasions of reception. The kitchen, steward's rooms, and other adjoining offices, were added 1494-1501 at the south end of the hall. There is a gallery within the castle court against the more ancient north side, and at the north-west angle of the court a handsome projecting Jacobean staircase. The keep erected 1345-81 if not of an earlier date, remained a shell in ruins until it was rebuilt on the old foundations by A. Salvin for students' quarters connected with the new university lately founded by the dean and chapter. The domestic chapel dates between 1529-59. The clock-tower above the Norman archway of entrance is modern.

The cathedral, dedicated to S. Cuthbert, is remarkable as presenting no variation in the lines of the nave and choir. The walls are constructed of sandstone from the coal measures, not of very durable quality. An attempt was made about the middle of the last century to restore the outside of the north and east fronts by paring off the decayed surface: under this operation the molded portions of the building lost much of their original character and the flat surface now presents that appearance of stunning which results from the use of the hammer and chisel. The western towers, up to the top of the clear-story, are pure Norman; above this level is a tier of Early English pointed arches, then a smaller range of blank arches with semicircular heads; again a tier of rather high pointed arches, of which six forming the central compartment are open; over these a range of small semicircular arches, and on the central compartment a corbel-table course. An open parapet was erected about 1760, at which time also the porch or frontage of the great northern door was built. Several old representations of the west towers shew them to have been surmounted with leaded broaches.

The foundation of the cathedral was laid 11 August 1093; the choir, aisles, and transept, date 1095-1199; the nave up to

the vaulting and the walls of the aisles 1099-1129; the nave was roofed and the aisles vaulted 1129-1333; the north and south doorways of the nave 1153-1154; the galilee projecting from the west end 1154-1197, has five aisles, and was repaired 1406-1437 when the exterior was much altered on the west, particularly by the insertion of a large central Perpendicular window; the wooden roof of the nave was removed, and with the south transept were groined 1233-1244; the chapel of the nine altars built athwart the east end, 1232-75 (BILLINGS), was completed before 1405 (*Ecclesiologist* *Journal*, xiii, 327); and the arched compartment of the choir adjoining circa 1289. The cloisters, commenced 1368, had new mullioned archways built around it at the close of the eighteenth century.

The west window and those of the south aisle of the choir date 1341-1374, restored with the whole of that aisle 1842; the north transept window 1374, restored 1494-1519; that in the south transept dates about 1450; those in the south aisle of the nave were inserted 1416-1446; some repairs were made 1660-1661, the tracery of the windows in the north aisle are of that date. In 1775 a general repair of the edifice was commenced by J. Wyatt at a cost of about £30,000. The gable of the south end of the chapel of the nine altars with its west turret were erected from a design of I. Bonomi, who also restored the gable of the south transept and designed its west turret about 1828. The central tower was repaired 1809-1812 by W. Atkinson; it is now, 1859, being restored by G. Gilbert Scott, Messrs. Walter and Robson, architects superintending.

The bishop's throne dates 1345-1381; the altar-screen 1380, of Caen stone, executed in London at a cost of £533:6:8, is perhaps the most remarkable in the kingdom. An appropriate open marble pillared parapet by A. Salvin encloses the space in front of the altar. The stalls of the choir, 1650-90, were designed by James Clement. Within the choir there is a new stone pulpit of good design and several new richly carved seats; the Jacobean screen enclosing the choir westward has been removed and no substitute for it hitherto fixed. A new stone font of Norman design has replaced the font of 1630. The chapter house, dating 1133-40, was greatly injured by the removal of its vaulted ceiling and apsidal end, about 1779, by ... Morpeth.

The principal interior dimensions are, the nave 205 ft. 4 ins. long; the transepts, 81 ft. 1 in. wide, including the aisles; between the columns, 32 ft. 4 ins., and 77 ft. high; the choir, 174 ft. 10½ ins. from inside of tower arch to east wall of the chapel of the nine altars, by 77 ft. 2 ins. wide; the chapel being 129 ft. 5 ins. long, by 34 ft. 2 ins. wide from east to west; the transepts are 171 ft. 9 ins. long, by 33 ft. 7½ ins. wide, including the aisle; the Galilee is 76 ft. 6 ins. long, by 47 ft. 11½ ins. wide; the internal dimensions of the central tower at the corbel table are, east to west, 34 ft. 0½ in., north to south, 33 ft.; the total height, from the pavement to the top of parapet, being 216 ft. 8 in.; the extreme internal dimensions of the cloisters are, north side, 145 ft. 6 ins., south, 144 ft. 10 ins., east, 147 ft. 8½ ins., and west, 146 ft. 8½ ins.

Of the abbey buildings a greater proportion remains than of any monastic establishment in England. The dean's kitchen, dating 1368-1370, is octagonal on plan, 36 ft. 8½ ins. in diameter the groined roof is singular (BILLINGS), the cost, according to the Roll still in existence, was £180:17:7. The frater house was converted into a library about 1680, and contains besides a large collection of books and manuscripts, several Roman altars found in the neighbourhood. The crypt under the library is of the Norman period. The crypt of the deanery chapel is Early English; other portions of the deanery date 1416-1446. The dormitory, 1398, restored 1850-1, and fitted up as a library and museum, is 190 ft. 7 ins. long, 38 ft. 11 ins. wide, and 31 ft. high. A crypt of the same dimensions is 15 ft. high to the crown of the vaulting. The bishop's exchequer on the Green, north side of the cathedral, and its burying ground



containing some remarkable tombs, date 1437-57, an adjoining library, 1684, are now, with other buildings dependent on the castle, assigned to the university.

Of the parish churches S. Mary-le-Bow is said to occupy the site of the first built church in Durham, traditionally a bough or wattled church, in which the remains of S. Cuthbert were temporarily deposited; S. Mary the Less has lately been rebuilt; S. Giles has some good Norman transitional windows; S. Margaret has some pillars and a good font, all of Norman work; S. Oswald in the borough and parish of Elvet, in great measure rebuilt by I. Bonomi after it had suffered much damage from the excavation of coal underneath, contains some features of interest; and S. Nicholas in the market place, 1842, is by C. Pritchett of Darlington. There are some remains of a chapel to S. Mary Magdalen. Of Kepier ancient hospital, outside the town, the gateway, cir. 1112, only remains.

The most remarkable of the city edifices is the town hall, 1850, by P. C. Hardwick of London; and the county infirmary, 1849, by Messrs. Thompson and Johnstone of London, given in the *ARCHITECT Journal*, i, 89. There are several institutions also of recent date with appropriate buildings. The grammar school has been removed from the Green to a site without the town. The county gaol has lately been much enlarged. The Durham Junction viaduct, erected 1837-8, is 810 ft. long, the height from the foundation of the centre pier to the top of the parapet being 158 ft.; it has four arches, one of 160 ft. span, almost semicircular, another 144 ft., and two of 100 ft. span each; there are also six smaller arches; *CIVIL ENGINEER Journal*, x, 164; and HANN and HOSKING, *Theory, etc., of Bridges*, 8vo., London, 1843, pl. 43.

Neither description nor delineation can convey to the mind the impressive and massive grandeur of the interior of the cathedral. In no part of England, and indeed nowhere else in Europe, can the Norman style be so well studied in its original, unmixed character, and in its purely derived transitional off-spring, of which the galilee presents a most remarkable specimen. This portion of the cathedral is now used for evening service in summer. No church can be better adapted to the purpose; its beautiful coupled pillars linked by their capitals present only a sufficient obstacle for the desirable avoidance of complete exposure to view; and the subdivision of the area, 76 feet wide, into five aisles maintains throughout the edifice a beautiful relative proportion of height with width. The architectural student may be assured that Durham has many claims to his attention.

I. B. BILLINGS, *Illustrations, etc., of the County*, 4to., 1846; also his *Illustrations of the Cathedral*, 4to., 1843; SURTEES, *History of the County*, fol., 1816-40; HUTCHINSON, *History, etc., of the County*, 4to., 1785-94; ORNSTEIN, *Sketches of Durham*, 8vo., 1846; SANDERSON, *Antiq. of Durham Cathedral*, 12mo., 1767; *Durham Cathedral as it was before the Dissolution*, 12mo., Durham, 1733; ENGLEFIELD, *Account*, etc., published by the Society of Antiquaries, fol., London, 1801; WINKLE, *Cathedral Churches*, 8vo., London, 1842; TAYLOR, *S. Cuthbert*, 4to., 1816; and WESTMORELAND, etc., *ILLUSTRATED*, 4to., London, 1833. A BRIEF ACCOUNT OF DURHAM CATHEDRAL, 8vo., Durham, 1833; RAINE, *S. Cuthbert*, 4to., Durham, 1828; and SURTEES SOCIETY, *Hist. Dunelm. Script. Tres*, 8vo., Newcastle, 1839, give the particulars of contracts and expenditure for works executed between 1398 and 1488.

DURHAM (ALDHUN, ALDUNE, or ALFON, OF), bishop of Durham, is recorded by SIMEON DUNELMENSIS in TWYSDEN, *Decem Scrip.*, fol., London, 1652, col. 28, as having been the builder, about 996-1000, of his cathedral at Durham.

DUROCORTORUM, the ancient name of Reims in France. DURY or DU RY ( . . . ) was oberbaudirektor to the elector William I. of Cassel, for whom he designed many edifices, inclusive of a country house at Wilhemshöhe and another opposite to it, both of which were completed by Jussow. Dury died about 1780 at Cassel, where he had been professor in the

academy, and had erected, in the French style of the period, several edifices, inclusive of the museum which was subsequently altered by the application of Ionic pilasters. 68.

DUST BIN. A receptacle for dust in private houses, public buildings, docks, manufactories, etc. It should be in the open air, but is too often within the walls even of a dwelling: where there is no area, as is often the case in London, the dust should have only a box sufficiently large for the dust produced in one day, or at the most in two days. It is not unusual to keep dust in a cellar, or to convert a small cellar into a dust bin or dust hole; this is almost as objectionable as a dust bin within the walls. An external dust bin requires a flap on the top, or else an upper hatch door, to allow the dust to be thrown into it; and a lower hatch, or a slide, in the face, to allow the dust to be cleared out. This lower door should shut against a sill flush with the floor; so that when the bin is cleaned nothing need be left in it: the cause of an ill-scented dust bin is the long detained residue, more frequently than any chemical action produced soon after the contents are first received. The bottom should be paved.

DUSTER. A large brush, chiefly used by glaziers for brushing putty joints, and for taking the oil on the glass. 1.

DUST SHAFT. A sort of flue which, in houses where each story has a separate occupancy, is now frequently introduced for the conveyance of all the dust to a common receptacle; each floor being furnished with a door opening into the flue. This door ought to have a hopper or rather hood inside it, so that a simultaneous discharge from two floors might not cause any nuisance or inconvenience; and for the same reason the top or lid of the dust hole should swing with a balance weight. A dust shaft from the hearth of every fireplace in a dwelling formed part of the "improvements", etc., patented 21 September 1843 by William Denley, and illustrated in the *CIVIL ENGINEER Journal*, 1844, p. 153.

DUSYE (JEAN) is considered to have been the architect employed in the construction of part of the church at Moret, in the department of the Seine-et-Marne in France, where his name with the date 1594 appears on one of the *tourelles* which terminate the buttresses of the belfry. COMITÉ HISTORIQUE DES ARTS, etc., *Bulletin*, 8vo., Paris, 1842, p. 269, 474.

DUTCH ARCHITECTURE. There are few countries in Western Europe in which the style of building generally adopted at one period of its history presents so distinct a reflex of the national tastes, feelings, and modes of thought as was the case in the Netherlands; and yet hardly any records of the various stages of development of architecture in that country are to be met with, nor can it be said that any complete account of the Dutch architects, or of their works, at present exists. It is true that the numerous relics of the Romanesque period still to be met with in the Netherlands have been described and illustrated by M. EYCK VAN ZUYLICHEM; and that the labours of Messrs. ALBERDINGK THYM, GODEFROI, BUCHLER, OLMANS, REUVENS, and especially of the members of the *Maatschappij tot Beoordering der Bouwkunst* of Amsterdam, have thrown much light upon the history of some of the national monuments, and upon certain periods of Dutch architecture; yet no book can be referred to as containing an authoritative view of the building arts under the influence of the political changes to which the country has been exposed. The following attempt to supply this deficiency in the chain of archaeological history must, therefore, be regarded rather as an indication of what is required, than as affording a satisfactory solution of the question.

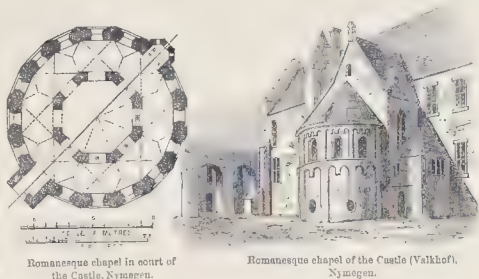
The most important remains of buildings erected during the Roman occupation of the lands inhabited by their faithful followers the Batavii, have been found in the neighbourhood of Nymegen, or under the ordinary level of the sea upon the shores of this part of the continent, which really seems to be situated upon the opposite end of the lever to Stockholm and the coast of Sweden, and to suffer a gradual depression.

The objects discovered near Nymegen consisted, however, principally of fragments of sculpture, altars, and pottery; the ruins of the submerged temple of Nehalennia at Domburg in Zeeland were not sufficiently defined to display any peculiar architectural character. It would appear that the Batavii enjoyed a species of rude independence in the midst of their swamps and morasses; and that the positive occupation of the country, by the Romans, hardly extended beyond the district where the Rhine divides into the numerous branches which flow over the alluvial deposits of its embouchure. During the reign of Charlemagne, however, the great struggle waging between that monarch and the Saxon tribes of North-western Germany, led to a more extended settlement of the provinces, which bounded the possessions of the latter; and it thence happened that the districts subsequently known as Guelderland, Utrecht, and Friesland, were made the seats of permanent military occupation; and were inhabited by a fixed urban population at a more comparatively early period than the swamps and forests wherein the semi-barbarous Saxons took refuge. It was not until the end of the tenth, or the beginning of the eleventh, century that any consecutive measures were adopted for the reclamation of the *Zeelands* at the mouths of the great rivers Scheldt, Maas, and Rhine; whilst the embankment, of Holland properly speaking, and the foundation of its numerous cities, only took place about the eleventh and twelfth centuries; these operations were, it must be observed, very seriously impeded by the dreadful catastrophes which successively produced the present outlines of the Zuyder Zee, the Dollart, and the Beisbosch. During the whole of this strange chaotic period, the inhabitants of the present kingdom of the Netherlands were under the political rule of the counts of Flanders and of Holland, or of the dukes of Friesland and of the bishop of Utrecht; and for ecclesiastical matters they were exclusively placed under the jurisdiction of the bishop of Utrecht, who was himself a suffragan of the archbishop of Cologne. As might naturally have been expected under these circumstances, the style of the ecclesiastical buildings erected previously to the thirteenth century was strongly marked with the taste of North-western Germany; and even the more recent structures of the diocese of Utrecht bear evident traces of imitation of the architecture adopted at Cologne. But after the House of Burgundy had extended its power over the whole of Flanders and the Netherlands, the style which became fashionable in the latter countries was based almost exclusively upon the one in favour at the court of Dijon. It happens that the majority of the mediæval civil and military structures of the Netherlands still in existence date from this period; and it was not until after the violent separation of the united provinces from the dominions of the Spanish monarch, who had inherited the principal portion of the possessions of the House of Burgundy, that any attempt was made by the Dutch architects to elaborate a style of building exclusively typical of the modes of thought of their fellow countrymen. The political revolution which thus established the independence of the Dutch was itself indirectly a consequence of the Reformation and of the revival of learning, or rather of the study of antiquity, which characterized the end of the fifteenth and the beginning of the sixteenth centuries; and it has thus happened that the tone and expression of Dutch architecture has been indelibly impressed with the same taste for the imitation of classical forms which may be observed in the philosophy and the literature of the brightest periods of the national greatness.

According to M. VAN ZUYLICHEM, the only well preserved monuments of the period anterior to the eleventh century which survive in the Netherlands, are the octagonal chapel, in the gardens of the castle of Valkhof near Nymegen, supposed to have been erected by Charlemagne; and the small chapel attached to the same castle. These monuments have been carefully figured by M. OLMANS, *Description de la chapelle*

ARCH. PUB. SOC.

*Carlovingienne, et de la chapelle Romane, restes du château de Nymegue, 4to., Amst., 1847; and it may suffice here to say*



that they strikingly resemble the contemporary buildings of Aix-la-Chapelle. They are in a tolerable state of preservation, thanks to the energetic interference of M. In de Betouw about the year 1799. Even at that stormy period the interests of archæology were better appreciated than they had been in the earlier days of the Dutch Republic; for in 1627 the municipal authorities of Groningen demolished an octagonal chapel, in their town, said to have been analogous to the one at Nymegen. M. VAN ZUYLICHEM, *Les Eglises Romanes du Royaume des Pays Bas*, obl. fol., Utrecht, 1858, gives indeed drawings of some of the earlier churches still in existence; but inasmuch as according to R. P. DOM PITRA, *La Hollande Catholique*, 12mo., Paris, 1852, there were not less than ninety-six monasteries and abbeys in the province of Friesland alone, and not less than a hundred and forty-eight establishments of all orders in the province of Utrecht, many of the most important and interesting of this class of structures must have disappeared entirely; and amongst them, no doubt, many specimens of the earlier types of the round arched, or Romanesque architecture.

There are still in existence many churches of the second period of the round arched style in the Netherlands; that is to say, of churches erected subsequently to the close of the eleventh century, and previously to the introduction of the Early Pointed arch. At Utrecht the churches of S. Peter and S. John, and the porch of the church of S. Nicholas; the churches at Rinsumageest in Friesland, and of S. Plechelm at Oldenzaal in the Overijssel; and parts of the churches of S. Leubin at Deventer, S. Martin at Emmerik, S. Martin at Groningen, etc.; may still be referred to as illustrating the style of this period. In the provinces of Friesland and Groningen there are also a great number of parish churches, which were erected in the twelfth and thirteenth centuries, and which are figured in M. VAN ZUYLICHEM's work, above quoted. All these buildings are characterized by the massiveness of their piers and columns; by an absence of decoration, apparently caused by the nature of the building materials employed, viz. the hard transition limestone of Brabant and the brick of the country; by a very simple massive character of molding; and by the absence of vaulted roofs.

The Early Pointed period of Dutch architecture is represented by the remarkable churches at Delft, Dordrecht, Deventer, Rotterdam, Haarlem, Utrecht, Amersfoort, Kampen, Nymegen, Woudrichem, Bois le Duc, Amsterdam (the Nieuwe kerk); by the Lotterij zaal at the Hague, by the tower called Van Oldehove at Leeuwarden; and by the original parts of the churches of Leyden, Gouda, Middelburg, Flushing, Zwolle, etc. They may generally be described as being strikingly like the contemporary buildings erected on the banks of the Lower Rhine, excepting in so far as their decorations have been modified by the materials employed, or as their general outlines have been influenced by the construction dependent on local conditions. Thus in the marshy districts, and towards the sea-shore, it is invariably the case that wooden roofs have been substituted for the stone vaulting adopted in the churches erected at that



period in other parts of Europe; and this fact, in connection with the baldness of the moldings and the general absence of sculptured decorations, together with the modern pewing, pulpits, organs, and whitewash, may account for the unsatisfactory appearance of most of the later mediæval churches of Holland. It is indeed to be feared that at least the remark made by FERGUSON, that the Dutch architects of the middle ages "neither cared for the beauties, nor troubled themselves to understand the principles" of the architecture which then prevailed, is true; for there is a singular want of taste and of originality of design in their works. Yet in some instances the details of the churches, erected during the Burgundian period especially, were marked with more feeling; and the rood screen in the church of S. George at Amersfoort, and the brass chancel railing in the church of Weesp, may be cited as favourable specimens of the taste of the time in which they were executed. The painted glass at Gouda, and of the Oude kerk at Amsterdam, do not, however, redeem the ugliness of the buildings in which they occur.

The architecture of the Burgundian period of Dutch history is represented more strikingly in the civil than it is in the ecclesiastical buildings of the Netherlands; and the town hall at Middleburg, the Prinsenhoff and the Gemeenlandshuis at Delft, the Stadhuis at Gouda, the house No. 1065 in the Brugstraat at Maastricht, and the Kanselarij at Leeuwarden, may be cited as illustrations of the modifications of the flamboyant style adopted in the Netherlands previously to the declaration of its Independence; *Illustrations*, façade of a house, 16th century, at Delft (pl. 19). Even during the struggle of the eighty years' war the erection of important municipal buildings seems to have continued, and the taste of the *style de la Renaissance* exhibited itself in the hôtels de ville at Veer, Alkmaar, Flushing, and the Hague, in the Vleeschhall at Haarlem, in the Huis den Hoofden at Amsterdam, etc., which were built about this period. There is a quaintness and peculiarity of design, a picturesqueness of outline, even though it be accompanied by a heaviness of general effect, in all these buildings which certainly ought to have redeemed them from the censure so unsparingly inflicted on the Dutch town halls by some esteemed modern authors. It may be added that the Stadhuis of Gouda, the Huis den Hoofden at Amsterdam, the Vleeschhall at Haarlem, and the Kanselarij at Leeuwarden, have been measured and engraved under the superintendence of the *Maatschappij tot Beoordering der Bouwkunst*.

After the declaration of the Independence of the United Provinces the influence of the classical studies so successfully pursued by such men as Grotius, Grovius, Gronovius, Scriverius, Heusing, Buurman, etc., led to the total abandonment of the taste of the middle ages and to the exclusive study of the types of classical architecture. Henry de Keyser for instance, who erected the town hall at Delft, with the Oude, and Zuyder churches at Amsterdam, was an earnest advocate of classical studies; and his book, *Architectura Moderna*, fol., Amst., 1633, is one of the earliest of the good modern treatises on the subject published in north-western Europe. De Keyser was succeeded by Van Kampen, who erected the town hall of Amsterdam in a similar pseudo-classical style; and by Pierre Post, who built the museum at the Hague, the town hall at Maastricht, etc., and published his *Ouvrages d'Architecture*, fol., Leiden, 1715. At the same time the traditions of this national school of classical revivalists were illustrated by Vingbooms, who had erected the museum at Amsterdam, and published his early works in *Gronden en Afbeeldsels*, fol., Amst., 1688. Vingbooms was a favourite of William III of England, and it is to him that the majority of the best residences upon the Kaiser's and the Heeren Grachten at Amsterdam are to be attributed. Subsequently to the period thus illustrated by the triumvirate of Vingbooms, Kampen, and Post, the influence of French taste began to be felt in Holland as elsewhere; and the effective, honest, and picturesque style of house building which had

prevailed from 1600 to 1700 gave way to the awkward imitation of the Parisian mansions. Straight cornices of wood painted to look like stone, sham balustrades, and all the ordinary substitutions of plaster ornament for stone, became fashionable; even at the present day the influence of this taste may be perceived. In public buildings the same consequences seem to have followed from the influence of this imitation; and it may be said that the modern Dutch buildings were not characterized by either boldness of design, originality of thought, or constructive skill. The present school of Dutch architects, are however evidently labouring to discover a path for themselves. The new churches in Rotterdam and in the little town of Purmerende (by Messrs. Van Dam and Scholten) are buildings of considerable beauty in spite of some questionable details; and the church Onze Lieve Vrouwe Kerk, lately built at Amsterdam, together with the Zeemanshuis, the Postkantoor, and the clubhouse Arti et Amicitiae, are also creditable attempts to shake off the trammels of a bad school of art.

It thus appears that the constructions erected in the Netherlands between 1560 and 1700 were those, which may be most correctly considered to represent the characteristic indigenous architecture; and this may briefly be described as being domestic and almost personal in its general character, whilst it displays much skill in the application of the few materials at hand for the purposes of decoration. The churches, and generally the public buildings, of this period were awkward and heavy in their proportions and somewhat inelegant in their outlines, whilst the pewing, the organs, and the organ-lofts were positively ugly. The private houses of the merchants, however, were more successful, and are remarkable for the solid, earnest, quaint, and at the same time business-like character impressed upon them. They very frequently present their gable ends to the streets; every house having its own four distinct walls, being absolutely without party walls. They are usually built of brick relieved by elaborately carved stone dressings. They have as a general rule a broad marble staircase by means of which access is obtained to the ground-floor, or rather to the portion of the house reserved for the use of the family; for it seems to have been customary then as now to devote the basement to the use of the clerks or to business purposes. In the interior marble was profusely used; the joiners' work was massive; and it would appear that it was about this period that the Dutch began to acquire the remarkable skill they still retain in painting flat tints on wood. The topmost story, in the lofty gables, was exclusively devoted to the purposes of a peat store; and the projecting beam intended to carry the pulley for hoisting that fuel, was usually converted into an ornamental detail of the elevation. The roofs were always tiled and had a steep pitch, and the chimneys were often made to group picturesquely with the rest of the composition. In fact the style and taste of this period were "racy of the soil"; it suited Dutch habits and was typical of Dutch modes of thought, neither of which qualities are to be discovered in the wood and plaster imitations of Louis XIV, of Louis XV, or of Grecian architecture subsequently in vogue in the Netherlands. Unfortunately the municipal authorities of the Netherlands ruthlessly destroy the old houses which stand in the way of supposed improvements, and thus the characteristic architecture of the country is likely soon to be swept away.

DÉLICES DES PAYS BAS, 12mo., Brussels, 1720, and Liège, 1769; RADEMAKER, *Kabinet van Nederlandsche en Kieftische Outheden*, 4to., Amst., 1727 and 1792; and *Kabinet van Hedendaagsche Gezigten*, 4to., Amst., 1745; RIEMER, *Beschryving van's Graven Hage*, fol., Delft, 1730-9; GOETGHEBUER, *Choix des Monumens, édifices, et maisons les plus remarquables du Pays Bas*, fol., Gand, 1821; DAVIES, *History of Holland*, 10th to 18th century, 8vo., Lond., 1841; VAN OLLEFEN, *De Nederlandsche Stadt*, 8vo., Amst., 1793; LETH, *La triumpante Rivière*, etc., *diverses Veues*, etc., fol., Amst., 1719; COMNELIN, *Vervolg van de Beschryving der Stadt Amsterdam*, 4to., Amst.,

1693; KOSTER, *Schetsboek*, fol., Amst., 1858, published by the club *Arti et Amicitia*; HET VERHEERLIJKT NEDERLAND, 3 vols., 4to., Amst., 1752; and ISAAK TIRION, *Atlas van Zee-land*, Amst., 1760. A nearly complete list, in MS., of memoirs of Dutch architects was presented by M. Weeninck in 1845 to the Royal Institute of British Architects. G. R. B.

**DUTCH BARN.** The name given to two sorts of constructions which are really skeleton barns: *i. e.* they have a roof, and the necessary framing to receive planking (but generally the quartering is placed horizontally, as if the planking were to have its length vertical). In one sort the barn is large and rectangular, and the roof is fixed: in the other the barn is small and polygonal, and the roof is made to slide between the angle posts, so that when raised above the ordinary height, more quarterings can be slipped into their places by a pulley chase if necessary. 14.

A third sort is composed of four posts and a roof, and is used as a temporary shelter for a loaded cart, or waggon. A. A.

**DUTCH BRICK,** and the method of burning it as practised in Holland, see *s. v.* BRICK, MANUFACTURE OF, p. 140.

**DUTCH CLINKER.** This, which varies little in quality from what was called a Flemish brick, is 6 ins. long, 3 ins. wide, and 1 in. thick, and is usually laid on edge, either straight or herringboned, for the pavement of stables, yards, and other places of considerable traffic; because as they are very hard, any damage by violence to the pavement is usually confined to the few bricks which occupy the space where the blow is given, and because the bricks so damaged are easily replaced. The clinker has always been a favourite material for the pavement of stables, although the objection has been made that this is too hot for the feet of the horse. These have been successfully copied and even excelled in manufacture by Mr. T. Cubitt. The *BUILDER Journal*, xvii, 174, mentions the production of the 'adamantine clinker' as superior to the Dutch in shape, colour, density, and wear. CLINKER.

**DUTCH FOIL, GOLD, LEAF, or METAL.** (Ger. *Knitter* or *Rausch-gold*.) The names given to the leaves, manufactured at Nuremberg, of copper and its alloys: these are either thin enough to be applied in the same manner as gold leaf; or thinner still to be spread upon paper; or so very fine as to form the bases of the bronze-powder: URE, *Dict.*, 8vo., London, 1853, p. 283.

**DUTCH HUT.** The name for a large class of wooden cabins or huts rendered ornamental features by artists' skill. It differs, in being only planked externally, from the COSSACK HUT made with unbarked logs, and from the POLISH HUT constructed with similar logs upon brick or stone walls: the SWISS HUT depends on its gallery or galleries, and on its use of squared logs sometimes, for a character distinctive from that of the Dutch hut. Specimens are given in KRAFFT, *Plans des plus beaux jardins*, fol., Paris, 1809, i, pl. 69, 83, and fig. c, pl. 94.

**DUTCH PINK.** This, like English pink and Italian pink, is a bright yellow pigment produced by dyeing chalk or whitening with vegetable yellow tinctures, and is extensively used for colouring walls, etc., in distemper work.

**DUTCH RUSH,** see *EQUISETUM*.

**DUTCH TERRAS,** see *TARRAS, TERRAS, or TRASS*.

**DUTCH TILE.** The name given to the thin glazed earthenware, either white or white with a blue pattern, employed as the lining to the inner cheeks of the jambs and to the inside of the backs of fireplaces in England during the end of the seventeenth and the beginning of the eighteenth centuries, when they were usually procured from DELFT in Holland. They were, and are, also called *GALLEY* tiles, which name is more appropriate to the tiles, white, coloured, or ornamental, about 6 ins. square, but sometimes octagonal, etc., still used for the same purpose in kitchen fireplaces, and as a lining to walls in dairies and the shops of several trades. In France, *brique de chantignole*, *chantignole*, or *demi-brique*, is the name given to

ARCH. PUB. SOC.

the bricks or rather tiles, 8 ins. long and 4 ins. wide, but sometimes octagonal, and 1 in. thick, instead of the usual 2 in. thickness of the French brick, used as a lining to floors and hearths upon the Continent, and formerly in England: the same sort of thin brick being also employed as a lining for the backs of fireplaces on the Continent, the name was applied in England to the thin glazed ware above named. 25.

**DUTRY** (JACOBUS JOHANNES, *i. e.* JACQUES JEAN), born at Ghent 10 September 1746, designed a chateau at Quaedrecht; a country house at Meirlebeke; the pulpit in the church of S. Jacques and several houses at Ghent; the astronomical tower at Leeuwerghem; and the gardens of a chateau at Ojdonck, and at Wondelgem near Ghent. A chateau commenced by him 1807 at Vinderhout, and enlarged 1817 by J. B. van de Cappelle, is given in GOETGHEBUER, *Choix des Monumens*, fol., Ghent, 1827, pl. 71-2. He died 16 February 1825. Another architect of this name was his son. 101.

**DUVAL**, see BROUTEL (A.) and DUC (G. LE), and MANSART (F.), and MERCIER (J. LE), and MUET (P. LE).

**DUVAL** (COLIN) was appointed 21 September 1447 successor to Jenson Salvart as *maître et juré de ses œuvres de maçonnerie* by the city of Rouen: DEVILLE, *Récue des Architectes*, 8vo., Rouen, 1848.

**DUYVENE**, see DUVENÉ (PETRUS JESAIAS).

**DWANG.** This term means a piece of wood placed between two other pieces, such as joists, rafters, etc., in order to stiffen them. Thus dwangs are put between joists when they are more than 12 ft. long, to stiffen the floor by preventing lateral movement in the joists. The term "herring-bone dwang" is the name also given in Scotland, for the best kind of dwanging for floors. The joists have fillets nailed on the sides at top and bottom, and the dwangs are wedged in between them. Sometimes the same form of dwanging is done without the fillets, the ends of the dwangs being "stubbed" or let into the sides of the joists; but the result is not so good. STRUTTING. C. G. H. K.

**DWARACA, DWARICA, or DWARKA.** A town at the western extremity of the peninsula of Guzerat in Hindostan. According to Brahminical legends it is the most original and sacred spot in this quarter of India; the celebrated temple, dedicated to Buddha Trivicrama and to Crishna, is described with considerable minuteness in TOP, *Travels in Western India*, 4to., London, 1839, p. 422-42; and a view is given in GRINDLAY, *Scenery*, 4to., London, 1826, pl. 32.

**DWARF.** An adjective employed to denote something short or low in height, as closets or cupboards, wainscoting, and walling. A DWARF CLOSET is usually about half, but sometimes may be seen about three-quarters of the height of the usual closet. In the parlours of small London houses, in the recesses at the sides of the chimney-breasts, dwarf cupboards formed of deal lining, with single or folding doors, skirtings, and mahogany tops, are common; in height being about 3 ft. or 3½ ft. with a drawer sometimes introduced.

A DWARF DOOR is one which fills the lower half of a doorway usually from 3 ft. to 3 ft. 6 ins. high, and frequently has a flat ledge at the top on which to place parcels, etc. DOOR. A. A.

DWARF WAINSCOTING is that which occupies only part of the height of a room; being usually from three to six feet high: when about the former height, with base and surbase, it corresponds to the continuous pedestal of the order with which the walls of the room may be supposed to be decorated; but of which, perhaps, the only other member introduced is the cornice: in such case the part between the base and the surbase is called the DADO. J. W.

A DWARF WALL properly does not rise to the whole height of the story to which it belongs; or the height that may generally be given in the vicinity to a ground floor. Thus where a wall is built as a screen, or where a fence wall is so low as to require a railing or other protection to complete its purpose of an enclosure, the term dwarf wall is generally applied. Good



illustrations of the employment of a dwarf wall, if it may be so called rather than an attic, separating the dripping eaves of a roof from the gutter, are given in VIOLLET LE DUC, *Dict.*, s. v. *bahut*. The term is also applied to a SLEEPER WALL.

DYASTYLE. A mistake for DIASTYLE, or for DYOSTYLE or DYSTYLE.

DYE, see DIE; and STAIN.

DYER (CHARLES), F.I.B.A., born in 1794, was the son of a surgeon in Bristol, and a pupil of W. M. Brooks of London. At and near Bristol he erected, 1830-1 S. Paul Bedminster church (Perpendicular Gothic); 1835 the Bishop's college; 1839-41 the Victoria rooms, Clifton, having a large projecting portico of the Corinthian order, the columns being 30 ft. high, and a hall 117 ft. long, 55 ft. wide, by 48 ft. high (COMPANION TO THE ALMANAC, 1839; ILLUSTRATED LONDON NEWS, xix); 1844 Christ church, Clifton (Early English); 1848-9 S. Mark Easton church (Norman); Wick and Ubsen church (Decorated); the savings bank; the female orphan asylum at Hook's mills; a school; and several villas in the neighbourhood. His works had an important influence in giving a superior stamp to the future erections of the neighbourhood, which possesses in consequence buildings that vie in elevation of character, execution, and effect, with those of any other modern European country town. In London he designed 1839-40 the hall of the Dyers' Company, Dowgate-hill (the front altered for improvements 1856); and 1841-2 the sets of offices called Old Jewry Chambers, Old Jewry, having cast iron girders with half-brick arches in cement, as detailed by him in the CIVIL ENGINEER *Journal*, v, 333. He died 29 January 1848, aged 54.

DYMENGE DE LEGERI, or as he is called in one of the entries, NICHOLAS DYMENGE DE REYNS, is supposed to have been a forger, and is noted as the principal person employed upon the cross at Waltham 1291-2, and also upon the tomb of the bowels of Eleanor, wife of Edward I, at Lincoln; according to the *Accounts*, from which extracts have been given by HUNTER in the *ARCHÆOLOGIA*, 4to., London, 1842, xxix, 184-6; and TURNER, *Manners*, etc., published by the ROXBURGH CLUB, 4to., London, 1841.

DYNAMICS. The science which treats of the motions of bodies free to obey the impulses communicated to them, without any reference however to the figure of the body moved, and on the supposition that for all purposes of analytical investigation the whole of the matter it contains is concentrated into one point. The science of *dynamics* differs from *mechanics* in this respect, viz. in the former the bodies are free to move, whilst in the latter the action of those bodies under the various forces affecting them is exposed to be modified by extraneous conditions. To quote the words of PLAYFAIR the term *dynamics* signifies literally the doctrine of *power*, power or force being known as the only cause of motion, and being measured by the motion it produces. FORCE; MOVEMENT.

It may suffice to state here the simpler and more general laws of motion. These are, nearly in the words of PLAYFAIR: 1st. When a body has been exposed to the action of a force it must continue for ever in a state of uniform and rectilinear motion until that motion is destroyed by some other external agent. If two forces act upon the body and make with one another any angle, the line which the body will describe will be upon the diagonal of the parallelogram representing the respective forces; and if more than two forces be applied to the same point, though in different planes, the sum of the opposite forces will cause the body to move upon the line of their common resultant. RESOLUTION OF FORCES. 2nd. The action and reaction of bodies upon one another are equal; so that if bodies animated with velocities, which are inversely as their masses, were to meet, and if the directions of those velocities were to be directly opposed to one another, they would remain at rest. If the bodies between which collision

thus takes place should be elastic, they would resume their natural figure after collision with a force which tends to separate them from one another. A body is said to be perfectly elastic when in resuming its figure as much motion is produced as was for the time destroyed in altering it. If an elastic body strike against an immovable plane it would be reflected from that plane in such a direction that its motion, before and after collision, would make equal angles with the plane, but would be towards different sides. 3rd. Should the motion of a body vary, either in direction or velocity, this change must be ascribed to some external cause, because it cannot arise from anything in the inert mass itself. When the velocity changes, the cause of that change is called an *accelerating* or a *retarding* force, as the case may be; and if the body should be continually urged by the same accelerating force in the same direction, its motion will be uniformly accelerated, or its velocity will increase proportionally to the time. Thus if a heavy body, falling from rest, should acquire in the first second of its motion a velocity  $g$ , its velocity  $v$  after any time  $t$  will be  $v=gt$ ; and if  $s$  be the space through which it has descended, then  $2gs=v^2$ , or  $v=\sqrt{2gs}$ . As the space through which a body falls, in the latitude of London, is about  $16\frac{1}{3}$  ft. in the first second of time, it is customary in English works on dynamics to take  $g=32\frac{1}{2}$  ft. nearly. If a body be projected directly upwards, its motion would be uniformly retarded in the ratio of the velocity generated by a final velocity produced by gravity. 4th. If a heavy body should be projected in the direction of a straight line, not perpendicular to the horizon, it will describe a parabola situated in the vertical plane passing through that straight line, and having its axis perpendicular to the horizon. 5th. The changes of motion which take place in a heavy body, whether in velocity or in direction, are invariably made gradually and without irregular intervals; they are always proportional to a function of the force and time jointly. ELASTICITY. INERTIA. VIS VIVA.

The laws of *impetus* and of *central forces* form very important branches of the investigations comprehended in the science of dynamics; but they are generally discussed in the works which treat of physical astronomy, upon which science they have the most direct bearing. The laws affecting the motion of *fluid bodies* differ to some extent from those affecting solid bodies; and they also are separately discussed, under the title of HYDRODYNAMICS, in the majority of works upon physics. PLAYFAIR, *Outlines of Natural Philosophy*, 8vo., Edin., 1819; WHEWELL, *First Principles of Mechanics*, 8vo., Camb., 1832; and his *Elementary Treatise on Mechanics*, 8vo., Camb., 1841; MOSELEY, *Mech. Prin. of Eng. and Arch.*, 8vo., Lond., 1843; WEISBACH, *Principles of the Mechanics of Machinery and Engineering*, 2 vols., 8vo., Lond., 1847; WARR, *Dynamics*, etc., 8vo., Lond., 1851; PRONY, *Mécanique Philosophique*, 4to., Paris, an 8 (1797); POINSON, *Eléments de Statique*, 8vo., Paris, 1824; PONCELET, *Introduction à la Mécanique Industrielle*, 8vo., Metz, 1841; VENTUROLI, *Elementi di Meccanica e d'Idraulica*, 2 vols., 8vo., Milan, 1817; JAMIN, *Cours de Physique*, 8vo., Paris, 1858; DELAUNAY, *Cours Élémentaire de Mécanique*, 12mo., Paris, 1852; MORIN, *Leçons de Mécanique Pratique*, 4 vols., 8vo., Paris, 1846.

G. R. B.

DYOSTYLE or DYSTYLE. These words, derived from the Gr.  $\delta\upsilon$  or  $\delta\upsilon\sigma$ , 'two', and  $\sigma\tau\acute{\iota}\lambda\omicron\varsigma$  or  $\sigma\tau\acute{\iota}\lambda\omicron\varsigma$ , 'pillar', are sometimes used to signify the employment of two columns in a porch or portico; as in the expression 'dystyle in antis', applied to the entrance of Exeter Hall, London. The second form is preferable to dyostyle; because the latter, although correct, is not only likely to be confused with the term 'diastyle', but is also applied upon the Continent to a building that has coupled columns; e.g. QUATREMÈRE DE QUINCY, *Dict.* s. v., says "la façade du Louvre est un dyostyle." When the Gr.  $\delta\iota\varsigma$  is preferred to  $\delta\upsilon\sigma$  for the composition of the word, the form becomes 'distyle', to which exception might be taken.

# DRYING CLOSET.

PLATES 70 AND 71.

DRYING CLOSETS are apartments in which heat is applied in various ways, according to the peculiar plan or description of medium adopted, for the purpose of extracting water and other fluids from wet or damp materials by evaporation; a process which enters so largely into domestic and manufacturing arrangements, that a means of drying safely, rapidly, and economically, becomes a serious desideratum.

The importance of the subject will be evident, on mentioning that the manufactures of textile fabrics, linen, cotton, woollen, silk, paper, printing, paper staining, leather, gunpowder, starch, japanning, varnishing, cabinet work, bedding, carpentry, timber, chemical preparations, and many more, all require arrangements which will maintain, or not exceed, a given temperature, to avoid serious injury to the material, and consequent loss to the manufacturer.

At first, a close room was tried, the heat sustained at a high temperature, either by stoves placed within the apartments, or by fires beneath the floor, the latter being of stone or brick. The next improvement was the provision of motion in the air of the room by proper ventilation. A system by which the materials to be dried were subjected to the influence of the heated air, without the necessity of the operators exposing themselves to its deleterious action, was effected by having an apartment, the heat of which was regulated by proper contrivances, provided with an apparatus in which the materials to be dried were hung or fastened, termed "horses", drawing in and out of the room, on rails or tramways. By the application of hot-water apparatus, and the use of steam, much greater precision and safety in the operation have been obtained; and lately, since the institution of public laundries, the necessity for the rapid drying of linen, cottons, and woollens, has called for arrangements of a novel description to effect the object in the least possible time, as those who avail themselves of such institutions, have to pay for the *time* during which they occupy the washing and drying apparatus.

It would appear superfluous to describe the philosophical principles of drying, yet, as it has lately been asserted that it can be effected without ventilation (which is so diametrically opposed to all experience on the subject, that it would scarcely be possible to imagine that such an opinion could be put in print), it appears desirable to give an explanation of the natural process.

The principles on which effective drying depends, are simple and easily understood. Air, even at ordinary temperature, has a great affinity for moisture, and beyond doubt this varies with the electrical state of the atmosphere (which is generally positively, and the air of close rooms negatively, electrical) as well as its hygrometrical condition; this affinity increases as the temperature of the air advances within all known limits;

Air saturated with moisture, in a cubic foot

at 32° contains 2 grains of moisture.

" 48° " 4 "

" 60° " 6 "

" 68° " 8 "

(One cubic foot

of air absorbs one cubic foot of steam; one cubic foot equal to 527 grains.) The heat maintained must therefore manifestly be greater than that merely required to convert the moisture of the material to be dried into vapour, in order that

the affinity of the air for moisture, by adding to its temperature, may be increased; one portion of the caloric is exerted in rendering the water elastic, while the other is enabling the air to dissolve it.

Evaporation may be simply defined, as that process by which liquid is changed into a (gaseous or) aeriform state, by the application of heat. This vapour, at 32° Fah., expands by the application of heat, in the ratio of 1-480th part of its bulk, for every additional degree of heat applied to it. On cooling, it diminishes; if this be continued, as soon as the degree is reached beyond that at which the vapour was generated, it reverts to its liquid state. Evaporation is not affected in its amount by the pressure of air or other gases in the space in which the process is carried on: vapour, to an equal amount, filling a certain space *in vacuo* as easily as when it is occupied with a dense gas; the gaseous bodies only alter the *rate* or *rapidity* of evaporation, not its *amount*.

The space, however, into which the vapour is allowed to expand, exercises an important influence on the rapidity of evaporation; the quantity evaporated is exactly proportional to this. This may be stated in exceedingly plain terms; the larger the vessel the more it will contain; at the *same temperature*, vapour will rise from a body of water sufficient to fill a space of one hundred cubic feet, while it will as duly fill a space of ten cubic feet; but, in the latter case, the same quantity will not be evaporated, unless the temperature and the density of the vapour are correspondingly augmented. By enlarging the space, the rapidity of evaporation is also increased; and the pressure of air exerting no deleterious influence on the production of vapour, and air having an affinity for moisture, it follows that the greater the number of volumes of air admitted near or around an evaporating liquid, the greater will be the amount of that evaporation.

Evaporation is affected only in its rapidity by the presence of air or gaseous bodies surrounding it, and is resisted to a greater degree from this cause than is generally supposed. Thus it was found, that from one square foot of water-surface at a temperature of 90°, the evaporation was twenty-two and a half grains per minute, in a calm; in a moderate breeze, twenty-nine; and in a high wind it rose to thirty-five and a half grains. The point illustrated is explained by the rapid drying of the ground in a windy day, and the speedy evaporation of ether from the surface of the hand, while a current of air is directed upon it, or created by waving it in the air. The same effects may be observed by drying a towel before an open fire; the heat of the fire rapidly drying or rendering elastic the water on the side nearest it, whilst at the back the vapour rises slowly, and may be seen till it passes into the current of the chimney. This is, in fact, the reason why ventilation is considered essential to drying, as each volume of air (which, when dry, has an affinity for moisture, this being increased by raising it in temperature) carries off a certain amount of vapour; it is, therefore, clearly the most reasonable mode to afford a fresh supply of dry air, to take the place of that which is already saturated.

There is an erroneous idea prevalent amongst many, regarding evaporation, which it is here necessary to point out; this is, that no evaporation takes place under 212°, or the boiling



point. This has been truly termed a fallacious opinion; many degrees below the zero of the Fahrenheit thermometer, could it be seen, there is vapour evolved. Mr. Dalton of Manchester, was the first who experimentally investigated, in a minute and satisfactory manner, the principles and rationale of evaporation. From the results obtained he constructed a table, showing "the force of vapour from water in every temperature, from that of congelation of mercury at 40° degrees below zero of Fahrenheit, to 325°." For this table, which will be found extremely useful in all investigations made on applying steam to evaporating purposes, see STEAM, where this part of the subject will be fully discussed.

The new drying closet at the Middlesex Hospital, is six feet wide, seven feet high, eight feet long, and is heated by the direct radiation of the heat produced by the flue of the ironing stove passing through it; by which means it is kept at temperatures varying from 180° to 200° Fahrenheit, with little more fuel than would be required for the working of the ordinary ironing stove. It was originally constructed with an external air drain, but the drying not being satisfactory, the drain was closed, and the following results obtained.

Materials.						
Six blankets	44 lbs.	23	20	1 hr. 35 min.	200°	160°
Eighteen rugs	169 lbs.	87	81	1 " 35 "	200	160°

The closet, after the linen was taken out, gradually rose to the temperature of 200°. The quantity of fuel required to keep the closet and ironing stove in full work, was found to be about sixteen pounds weight of coke per hour. It will be observed, that the water evaporated from this closet is equal to one pound per minute, and the fuel consumed about one-fourth of the weight of water evaporated. The inference that a change of air in drying closets is not an assistance, but an impediment, is so much at variance with received theory and successful practice, that there must be something in the case which has been overlooked. . . . A current of air is an important part of the process of drying, perhaps it is as important as heat; for linen may be dried out of doors, where it will be subject to constant change of air about its surface, without artificial heat at all; but if hung in a saturated medium it will not dry, though at a high temperature. Any laundress practising open-air drying, will say that the difference between a good and a bad drying day lies here: in the former, the atmosphere is in brisk motion and dry; in the latter, it is still and moist. In other words, the linen dries most quickly when there is a rapid succession of dry particles passing over its surface. Artificial drying is, in fact, a twofold operation. By heat, the moisture is quickly converted into vapour; by ventilation, that vapour is carried away and replaced with dry air. If no fresh air were introduced, successive changes of wet linen would soon saturate the atmosphere of the closet, at which point drying would altogether cease.—BUILDER, vol. vii, pp. 177, 219, 245, 323.

In the construction of drying closets, every practical man is aware that a large amount of air finds entrance to the closet through the chinks and apertures, which cannot be avoided; this quantity being much larger than is generally supposed. The secret of the success of Mr. Jeakes' closets (the example above-mentioned being one of them) has been, that he has succeeded in proportioning very nicely, the outlet for the volume of heated air charged with water, and that the apertures allowed the necessary quantity of air—to be heated—to be admitted. Ventilation may be in excess; because the ingress of too large a quantity of cold air prevents the general temperature being raised to a proper point for promoting effective evaporation. The utmost effect will be obtained for a closet and heating apparatus of a given size, when the air admitted bears a definite and not to be exceeded proportion to the quantity of vapour to

be evolved in a given time—to the temperature—to the thickness of the textures—to the state of the atmosphere at the time as regards dryness and motion. Hence there should be area for ingress and egress sufficient for the greater required quantity of drying, under the least favourable state of the external air, with means of reducing that area for smaller quantities under a drier or less stagnant atmosphere.

The peculiar mode of ventilation, hereafter described by Figs. 9, 10, and 11, Plate 1, and followed in several public buildings, has not in any instance failed, and is apparently identical with the operation of that described as fixed at Middlesex Hospital; for although the air drain be rightly abolished, the same closet remains yet perfectly ventilated, and upon exactly the same principle; for although the narrow slit, made for the admission of fresh air, may not be provided specially, yet the steam cannot pass away with a sufficient rapidity, unless influenced so to do by a current of air, passing through the closet, powerful enough by its levity, compared with the external air, to carry or pass such steam away. *A small amount of aperture will, in reality, be sufficient*, when it is considered how much the volume of air admitted to the closet at 60° is expanded during its progress through and out of it, saturated with steam, at 200°; and that this is the operation constantly existing, is evident from a smaller closet heated by hot water in Park Lane, where sliding entrance and exit air-valves were provided in the centre of the floor and ceiling. When both were closed, the wet clothes were invariably rendered hot, but never dry, in twenty minutes; the whole of the steam that did escape finding its way into the laundry: on opening the valves, the lower one (which communicated with a room below), one-fourth of the area of the upper valve, a sufficient current of air was admitted to pass the steam freely away, without much loss of heat, but evidently, from two distinct trials, the establishment of the current was imperative.—BUILDER, vol. vii, p. 339.

Mr. Ashpitel found, in one instance, that a closet of this kind of construction was readily heated to 200°, but the clothes would not dry. In fact, for want of proper supply of dry air and exit for the reek, the water in the clothes rose as vapour, became condensed on the ceiling of the room, and fell back again upon the clothes in the form of a scalding rain, continuing this alternation for hours.

A very positive proof of the fact that wet material would not dry without ventilation, was found at the public laundries of St. Martin's in the Fields; the drying chambers, which are constructed of slate, were made quite air-tight previous to the ventilating apertures being made, and when the heating pipes were set to work the wet articles would not dry, although there was a temperature of 200° at the time; but as soon as the ventilators were opened, the drying was effected rapidly. It is quite possible to be deceived on this head, in experimenting with a drying closet; for notwithstanding there might be no provision made expressly for ventilation, it being unusual to construct closets so accurately as to render them air-tight, air and vapour at high temperatures are so exceedingly elastic, that ventilation would take place at every crevice; and, even if every joint was pasted over with paper, the vapour would most likely find its way through the pores of the wood or paper; and it is even possible that a closet may be of sufficient size, so that the amount of air contained in it may hold the quantity of moisture imbibed by a given quantity of material.

If it were taken for granted that drying could be economically performed, without specific means of ventilation, it would be bad in principle; as the free passage of air through wearing apparel is of great importance in clearing them from impurities, humidity, soap, and other matters, and freshening them. It has been experienced at the Surrey Lunatic Asylum, that wearing apparel, dried in a closet without ventilation and at a low temperature, came out with a very unwholesome smell; the same description of things, dried in a closet with a higher temperature and free ventilation, came out relieved of all ob-

jectionable properties; and this may be considered a fact applicable to lazarettos, and other places for disinfection.

It must be unnecessary to dilate further upon the condition of hospitals, prisons, unions, lunatic asylums, etc., with hundreds, sometimes thousands, of inmates suffering under all sorts of maladies, whose linen and wearing apparel are mixed together in the process of washing and drying, without ventilation in the drying closet. A workman, when removing the closet at the lunatic asylum before mentioned, slightly grazed the back of his hand against a piece of wood in the upper part of the closet; the following morning his hand was much swollen, although the wound was scarcely to be perceived; for many days he was unable to work, and did not become entirely free from pain for two months, leaving no doubt but that his hand was affected by some poisonous matter on the surface of the wood, and that death might possibly have ensued. It is admitted that this is an extreme case, but it is also clear that extreme cases cause all the mischief; and considering that mankind is periodically visited with the most astounding and appalling maladies, without its being known from whence they come or how they are promulgated, in all sanitary arrangements too great caution cannot be taken to ensure safety.

In the construction of a drying closet separate and distinct from other apartments, care should be taken to have the ground on which it stands free from damp, and the floor well paved. The lining of closets is generally of wood, grooved and tongued to prevent warping; glazed earthenware tiles might be adopted with advantage; Tredgold recommended thin slabs of marble. The great point to be observed is, to avoid loss of heat from the external parts of the closets. All should be made fireproof where practicable: thus the external walls should be of cellular brickwork, the ceiling being arched; slate slabs are good materials where brickwork cannot be introduced. When constructed of wood, the planks should be placed diagonally, and of a double thickness reversed. If this cannot be done on account of cost, then the woodwork should be of tongued battens; all the framework being morticed and pinned. In closets having a cockle and pipe-heating apparatus, a floor should be formed of finely-perforated iron trellis work, or strong wirework of fine meshes, to prevent small articles falling upon the heated pipes, and endangering the clothes by fire; indeed, every possible precaution on this head should be taken.

The horses on which the clothes are hung, admit of some variety of construction. They are often made of wood. Iron is unquestionably better, from its durability and strength. The rods on which the clothes are placed should be cased with brass tubing, or they should be covered with zinc, to prevent the iron-rust staining the clothes. For large closets the horses should run on friction-rollers, or wheels, in grooved tramways, with guide rods for the upper part. There are various plans of making and fixing these wheels, they are generally what are termed "edge wheels", running in grooved or rebated rails; at the top of the closet the horses run in grooves, or wheels are sometimes added. The rails are in many cases single; they are also shewn so in the illustrations; the wheels being fixed one at each end of the horse, but in Fig. 1 the rails are double. In this example (from the Prestwich Lunatic Asylum) the horses are triangular, which thus affords more rod space, than even the arrangement shown in Fig. 18, Plate 2. The box posts at the front of the closet are rebated on the front and



Fig. 1.

back faces, to receive the front and back doors, in which the rails are fixed. When pulled completely out to charge the horse, the door goes into the recess in the box posts; the same is done when the horse is put in its place, thereby preventing ingress of air. Instead of having edge wheels for the horses, Tredgold recommended rollers of considerable length, little

shorter than the breadth of the horse door, the side plates of the rollers being fastened to the posts of the horses by bolts.

Fig. 2 is a plan of a drying closet, possessing some advantages, and it might be very cheaply constructed: A is a semicircular chamber with a properly-arranged heating apparatus underneath it; B, a centre pillar, with radiating rods *cc*, fixed all round it at proper distances, and of convenient heights. This column of rods should be

1 2

equally divided by a nearly air-tight upright door, shewn at *dd*, which, when closed, leaves half of the number of rods inside, and the other half outside, the closet. As soon as one side is loaded, that is turned into the closet, and is drying during the time that the part then standing outside is being emptied and charged. In large establishments, two or more of these closets may be placed side by side. They certainly present considerable facility of construction and management, as they do away with the rolling in and out of large horses, and also the expensive construction attendant upon that plan.

The construction of the furnaces must be left to the contrivance of the manufacturers, as different treatment will be required according to the nature of the fuel; the great point to be observed is the non-admission of superfluous air into the smoke flue, as all air admitted, over and above that required for the perfect combustion of the fuel, has a direct tendency to cool the pipes, and convey the heat to the chimney to waste.

The method of ventilating these closets is a subject of some difference of opinion amongst practical men, namely, as to whether it is best to take the ventilation from the bottom or from the top of the closet, and it would appear somewhat difficult to decide; it is certain that either way will answer the purpose. With the ventilating tube placed at the bottom, the heating apparatus being under the floor of the closet, and a sufficient admission of fresh air round it, the heat will rise through the clothes, taking up the moisture as it passes; then, becoming heavier, it falls down through the clothes, taking up a further quantity, and passes to the ventilator; the heated air circulating in the closet according to the laws of all fluids under the influence of heat. On the other hand, when the ventilation is from the top of the closet, the heat passes up through the clothes at once to the ventilating tube, and is lost. Again, when the ventilator is near the bottom, and the current in the ventilating tube very strong or rapid, much of the heat passes directly to the opening without effecting any drying, or passing amongst the clothes at all. Taking all things into consideration, ventilation is best from the top, provided the outlet have a properly constructed valve, capable of adjustment. Practically the best, or rather the quickest, plan of drying, is to shut up the ventilator until the closet has attained a considerable temperature, and then to open the ventilator, letting the vapour pass off as quickly as it will; for it is found by experience that when a charge of damp clothes is placed in the closet, the temperature falls considerably until the things have absorbed much heat (*i. e.*, the specific caloric required to change the water into vapour), and the drying is not rapid until they attain a considerable temperature. A thermometer should be placed in the external wall, sympathizing with the air of the closet.

Fresh air should be admitted in such a manner as to impinge on or sweep over the surface of heated pipe, the greatest quantity on the hottest part of it; it is doubtful whether the opening should ever be closed, although it has been recommended to have movable covers to admit more or less as may be required. Finely perforated gratings should cover these openings, to prevent the admission of small animals and insects, and to prevent combustible materials from being drawn in. All smoke flues should have air-tight covers to allow of cleaning out soot and dust.

The smoke flue of the heating apparatus should always be made the means of ventilation when practicable. The flue



should be double, that is, one flue outside another. The inner one, or smoke flue, should be constructed of stoneware pipes, ten or twelve inches diameter, with the apparent chimney built round it, Fig. 3, and the ventilation of the closet led into the casing. The advantage of this plan is that the gaseous products of combustion keep the flue pipe warm, creating a current in the surrounding case, so that there is a ventilating tendency from the closet. This

might equally be effected by leading the ventilating tube at once into the smoke flue, but there is the liability of adverse winds, defective draught of the smoke flue, or other reasons which might cause the smoke to descend through the ventilating tube into the closet, to the serious damage of the clothes. The ventilating tube should have a valve, with a lever handle under the controul of the attendant, to stop or regulate the ventilator as may be required. It has been found that for a closet containing one thousand cubic feet, an opening into the ventilating tube of one hundred and twenty square inches, or about eleven inches square, has been ample. This may be varied according to the judgment; it is clear that a small opening, with a good current, will be efficient, when a large one, with little or no current, would be inoperative.

To assist in proportioning the requisite amount of heating surface in steam and hot water pipes, and by approximation, cockles and hot air pipes, TREDGOLD instituted experiments by which he was enabled to draw up the following list of the absorbent powers of different articles. In the trials, the clothes were wrung as they usually are in washing, before being weighed in the wet state.

	Weight dry.	Weight wet.	Weight of water absorbed.
Wool, in flannel . . .	1 lb.	3 lbs.	2 lbs.
Cotton, in calico . . .	1	2.135	1.135
Silk . . . . .	1	1.9666	0.9666
Flax, in linen . . .	1	1.75	0.75
Flax, in sail cloth . .	1	1.75	0.75
Paper, foolscap . . .	1	1.2857	0.2857
Paper, drawing . . .	1	1.24	0.24

"Now, in order that equal weights of these different species of goods should be dried in equal times, the force of heat for the flannel should be sufficient to abstract 2 lbs. of vapour; while that for the calico need only be sufficient to abstract 1 lb.; and that for the linen three-quarters of a pound."—TREDGOLD, *Treatise on Warming and Ventilation*, page 251.

By adopting 90° as the maximum temperature of the heat used in a drying closet, he also formed the following rules for proportioning the quantity of pipe and ventilating orifices. At a temperature of 90°, the mean of several experiments shewed that one cubic foot of water was evaporated from each 2700 square yards of cloth, or 5400 square yards of surface, each piece of cloth having two sides or surfaces, or nearly one-hundredth of a cubic foot for each piece of cloth of twenty-five yards. For each yard he found that fifteen cubic feet of air per minute were required to carry off the vapour; this he however doubled, making it thirty, so that for a piece of twenty-five yards, 750 cubic feet of air per minute were required to carry off the vapour—"the heat required per minute for each piece of twenty-five yards, will be equivalent to evaporating one-hundredth part of a cubic foot of water, and heating 750 cubic feet of air from the temperature of the external air to 90°. The quantity of steam pipe to evaporate one-hundredth of a cubic foot of water is 138 superficial feet. The quantity to heat 750 cubic feet of air to 90°, supposing the external air to be 40°, is, (by the rule given in HEAT) equal to 132 feet"; adding these quantities together, the area of pipe for each twenty-five yards of cloth is 270 feet. The area of ventilating tube is easily found; for each 270 feet of surface of pipe 750 cubic feet of air is to be passed through each minute; to this latter quantity is to be added one-thirtieth of its bulk of steam, making 775 cubic feet. Using the formula of TREDGOLD (*Treatise*, art. 64, note),

$$\frac{B}{300} = \text{cubic feet} \times \sqrt{\frac{450 + t}{h(t-x)}} = a \text{ or area; where } t = \text{internal temperature, say } 90^\circ; x = \text{external temperature, say } 40^\circ \text{ (less } 6^\circ \text{ for inferior specific gravity), and } h = \text{height of ventilating tube, say } 25 \text{ feet, to be measured from the centre of the hot chamber to the top of the egress aperture, the quantity } a \text{ will be about } 1.5 \text{ square feet for each } 270 \text{ feet of surface of pipe. In making calculations for drying closets, it is not enough to estimate the mere cubical contents of the apartment,—though this is necessary in calculating the area of heating surfaces,—the lineal dimensions of the drying rail ought also to be taken into account; as by a judicious arrangement of the horses, additional feet in many cases may be obtained; the lineal dimensions being given, the average quantity of cloth which may be hung thereon may be estimated; this being known, approximative estimates of the heating surfaces may be easily obtained. If the temperature is wished higher than } 90^\circ, \text{ all that is requisite is to alter the multiplier in finding the area of pipe.}$$

One superficial foot of iron water pipe, constantly maintained at 150°, will warm 100 cubic feet of space about 20° in ordinary dwelling houses, without especial means of ventilation; and one superficial foot of steam pipe at 212°, will warm 200 cubic feet the same number of degrees, presuming the air to be at 30° previously; and probably one foot of steam pipe at 250°, would warm 300 cubic feet the same number of degrees. One foot of small pipe will produce the same effect on 400 feet, when the pipe is maintained at 350°. One superficial foot of stove or pipe surface heated to 600° will produce the same effect on 600 cubic feet of air. It will be readily seen that these data are only approximative, but they will be found of service, as it is merely required to calculate the cubic space to be heated, and multiply the quantity of radiating surface; for instance, a closet to contain 1000 cubic feet, or ten feet each way, then 100 sup. ft. of water-pipe at 150° will produce 100° in the closet

50	"	steam pipe	212	"	100	"
100	"	ditto	212	"	120	"
50	"	ditto	250	"	135	"
200	"	small pipe	350	"	200	"
100	"	cockle	500	"	230	"

The above data are as near as the nature of the subject will admit; the quantities should on no account be less than those named, but rather more, as the amount of ventilation, and the degree of conducting power of the surrounding material varies so much in every case that it is next to impossible to construct exact tables; the difficulty may be estimated when it is considered that high temperatures cause rapid dispersion of heat. The above data have been repeatedly proved in a very extensive practice, and may be relied on; but much depends on the judgment, and considerable allowances must be made for variation in the material of which the closets are constructed, or of the containing walls; the radiation, conduction, and ventilation increase so rapidly with every rise in temperature, that the additional warmth is gained in an uncertain progression; and when very great heat is required, much increased power of apparatus will be necessary.

When drying began to be practised as an accessory to our manufactories, the arrangements were incomplete and unsatisfactory. A very usual form was a room provided with a common stove, the materials to be dried being hung from lines or spars, stretched across, near the ceiling. The "cockle" was also used, the major portion of it being in the room, the materials to be dried being protected from the overheated surface by wirework. Fig. 4 is a section, and Fig. 5 a plan of a cockle; *a a* is the iron casing; the flames and smoke arising from the furnace *f*, pass up and over the partition *b*, and down by *d*, out to the flue by the piping *e*; *e e* shew the line of wire work. The heating surface may vary from 200° to 1000°, or just red hot. It is by no means advisable to heat iron much above 400° for these purposes, as, at a greater heat, iron-work deteriorates fast from oxidation; and sulphureous gases and unequal expansion

soon cause the vessels to warp, crack, and become dangerous ; it is obvious, therefore, that all apparatus on this plan requires to be

Fig. 4. Section.



carefully guarded from combustible materials.

For dwelling houses in towns, where open air drying cannot be obtained, a closet with its heating apparatus may be made of great efficiency in a small space, the stove for heating the flat irons being the means of drying the clothes. There are several modes of accomplishing this object. Figs. 6 and 7, Plate 2, being plan and elevation, illustrate an arrangement of this kind, the smoke flue (shewn in Fig. 7), passing in a zigzag manner at the back of the closet. A diaphragm of wirework should separate the horses from the pipes, and the back and sides of the closet should be of non-combustible material.

Fig. 8 is a useful and safe plan for a large family when there is available space. *a* The washing room, *b* drying room, *c* ironing room, *d* stove for heating the flat irons, put under a fireplace for ventilating the ironing room; the smoke flue going out at the back, and branching into four iron pipes, *eeee*, each five or six inches in diameter, and entering into the smoke flue, *f*; this is found both efficient and economical. It is necessary to enclose the pipes, as before observed, for safety; and to provide flue doors at *g* for clearing out the soot. The materials to be dried hang on racks or lines, or in any other way most convenient.



The grand improvement in drying closets was introduced by Mr. Strutt of Derby. Instead of having the materials dried by hanging them in the heated atmosphere of the closet, whence they were to be removed by hand, he used arrangements by which the linen, etc., could be put on a rack in an apartment distinct from the drying closet; this rack, when filled, being capable of motion on wheels working into rails laid on the floor of the drying closet and contiguous apartment. The closets being heated by an arrangement of stove or cockle.

In the following figures on Plate 1, there are sketches of an improved construction of closet, having movable horses; the heating power being derived from cylindrical pipes, connected with a cockle or furnace. Fig. 9 is an elevation, Fig. 10 a plan, and Fig. 11 a transverse section. The tube for leading the products of evaporation to the chimney is provided with one or more valves to regulate the degree of opening; the box posts forming the front of the closet are rebated, as before described.

The following is a statement of the cost of working a closet formed on this plan, having seven horses fitted in it:

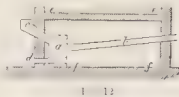
Fuel consumed including lighting.	Cost of fuel.	Lighted at 9.	Thermometer.
Wood	3d.	half-past 9	68°
Coals 14 lbs.	1½	half-past 10	132
Coke 1 cwt. at } 21s. per bushel }	1s. 3d.	half-past 11	182
		half-past 12	208

"It therefore cost 1s. 5d. to produce 208 degrees, which heat is more than required even for the coarsest sheets. The above heat was produced so gradually, as not to make the exterior iron-work red hot, nor even the internal neck of the stove, which it has generally been, when worked by the laundry women. Ninety-eight sheets were put on the horses all at once, and the laundry women have dried sheets in ten minutes, which should not be allowed, as drying is sufficient quick for them to be able to clear the first horse by the time the seventh is filled and closed, which the closet will do."—BUILDER, vol. vii, p. 333. Mr. Cooper, the originator of this species of drying closet, further says, in reference to the plan often adopted, of having the heating power supplied by the tube or smoke flue of the ironing stove passing through the closet,—“Reference to the explana-

tory sketches will show we prefer and use a furnace or fireplace distinct from the ironing stove, the whole of which fireplace is lined with six-inch thick Welsh lumps, and the connection of such fireplace with the heated flues is at a depth from the top of it; this arrangement allows coke always to be used: the charge being filled full, prevents any cold air from passing over the fire, as in the usual way into the flues, to the evident waste of the fuel, and it induces a total absence of smoke, creating only a fine drift or powder within them, easily removable. I have been compelled to give a preference to a fireplace, for the use alone of the drying closet, as in two distinct instances I have proved that when the quantity of clothes to be dried has been large, and the closet in constant use all day, and say, in five out of six days, the ironing stove, to be fully effective to the closet, has been obliged to be worked at far too great a heat for its own duration, besides overheating the room in which it is placed and where it is generally exposed. It has consequently been destroyed infinitely sooner than it would if confined to its own use."

In very small closets, the stove is best placed under the horses, the pipe or smoke tube passing also beneath them; the door for supplying the fuel being at such a position that the access thereto can be easily gained.

Fig. 12 shews this arrangement; *ee* is the floor of the drying closet, on which the horse rails are laid; *ff* that of the foundation; *a* is the stove made of iron; *b* the smoke or heated



air flue; *c* a hopper passing through the front wall, and communicating with the interior of the stove; it is provided with a lid or cover, which is taken off when fuel is to be supplied; *d* a small door by which the ashes are withdrawn from the ash-pit. Mr. Cooper dispenses with the large air drain, but provides a sufficient degree of ventilation by making an opening or slot extending the whole length of the front of the closet, the breadth being from half to five-eighths of an inch; this affords ample air to maintain ventilation, and by joining the ventilating tube into the furnace flue, the strong rarefaction within it produced by the heat, creates a power sufficing perfectly to ventilate the closet, the valve in general being open but one-half its range.

Drying closets for prisons, unions, asylums, etc., require much more powerful treatment; they are seldom less than ten feet square, often double this size. It is usual to place the heating apparatus under the closet, and it is necessary to maintain a high temperature on account of the great quantity of clothes to be dried. It is found that 100° of heat is quite inefficient for these establishments; the material would be injured at a heat much exceeding 200°, which of itself would be dangerous, and it may safely be stated that 160° or 180° would be found quite sufficient.

The Figs. 9, 10, and 11, before referred to, shew a large closet adapted for five hundred inmates, twenty feet long, ten feet wide, and eight feet high. It has twelve horses, the front faces of which, as well as the horses themselves, may be made of iron, but the enclosing sides of brickwork and slate; the whole of the bottom should be covered with perforated zinc, etc., as before described.

It will be obvious that there will be a great difficulty in raising the temperature to 100°, for drying purposes, in a closet heated on the low-pressure plan, with hot-water pipes averaging 150°: in fact, if the whole closet were filled with pipes at that temperature, it would be difficult to exceed the first-named heat by many degrees, and with free ventilation the difficulty would be insuperable: of course, if the pipes were placed in a case completely air-tight, and the containing case or closet were surrounded with perfectly non-conducting substances, so as effectually to prevent radiation or ventilation, the air of such closet would go on accumulating heat, till it attained the average temperature of the pipes, but in such a closet little drying could be effected. A closet or small room may, however, be heated



moderately with this kind of apparatus; and, allowing plenty of time and space for the air to circulate about the linen, it would be found to answer well for many purposes, and is also unquestionably safe, which is its greatest recommendation.

The applicability of the small pipe, or Perkins's heating system, has hardly been sufficiently appreciated. By this apparatus a temperature of  $350^{\circ}$  can easily be maintained in the pipes themselves; therefore, by placing the requisite quantity of material at this temperature, any required heat can be maintained under  $230^{\circ}$ , which has been often proved in many working closets; indeed, this plan affords greater facilities for drying purposes than any other. It may be observed, that it requires considerable skill and knowledge to erect it successfully. The next question is the safety of this form of apparatus, seeing that water at  $350^{\circ}$  has the explosive force of steam at the same temperature, namely, 135lbs. on the square inch. This at first sight presents a very dangerous aspect; but when it is known that the pipes of which the apparatus is constructed will bear a pressure of 4000lbs. on the inch, and are always proved to 2000, the difference is so great, that all fears on that head may be safely said to be at rest. The coil in the furnace should never exceed one-eighth, or better one-tenth, part of the whole series of pipe, providing they are of uniform area; and it has been experienced that no degree of heat, which can, under ordinary circumstances, be applied to the fire part of such an apparatus, can produce any dangerous effects, provided the water be unimpeded in its circulation, and this is a matter of easy attainment; the expansion tube should have a capacity of one-tenth of the whole contents of the pipe, inclusive of the furnace coil: the pipe must be guarded from wood or the materials drying, which it would inevitably scorch.

Upon this principle, and on a plan as safe but more expensive than that shown by Figs. 6 and 7, is the arrangement illustrated by Fig. 13, Plate 1. The ironing-stove or furnace is made with a properly-constructed boiler, from whence the pipes pass through the closet between the horses; another portion of the pipes being made to heat a tank of water for the supply of the washing tubs, which may be in an adjoining room, so as to avoid all the disagreeables of steam and damp. This arrangement appears, after being many years in use, to be one of the most complete, and, taken altogether, of a very economical construction.

Similar arrangements, in establishments where drying closets worked by hot water which also supplies the wash-tubs, are employed in conjunction with laundries, will be found exemplified in Fig. 14, which represents a longitudinal section of a drying-room placed above a wash-house; *h* is the flow pipe, and *i* the return pipe supplying hot water to, and withdrawing it when cooled from, the congeries of pipes *k*. The cold air gains admission through the grating, as shewn by the arrows, passes in contact with the pipes *k*, is heated thereby, rises up in the box *ll*, through the grated openings *m*, past the horses, out by the ventilator *f*, which is provided with a valve as before described. The bottom of the cold-water supply cistern must not be lower than the top of the cistern connected with the boiler, which is supplied therefrom by the pipe *n*, at the same time carrying cold water to the washing tubs; the boiler supplies hot water for the wash-tubs by the pipe *o*. Fig. 15 is a plan of the ground floor, and Fig. 16 that of the upper floor; the references apply equally to the three illustrations.

Steam pipe offers greater advantages than those of the low-pressure hot water principle, with regard to the temperature; as steam, conducted from a boiler working at about four pounds on the inch, would fill the pipes so as to produce an uniform temperature of  $212^{\circ}$  in them; and, although a higher temperature can be maintained, in the proportion of 150 to 212, yet the same reasoning applies as with the hot water apparatus.

The next means of producing heat is by means of high-pressure steam, where, by using a boiler working to thirty or forty pounds on the inch, a temperature of  $250^{\circ}$  may be obtained;

but the fact of the explosive nature of steam at such high temperatures, prevents the use of such an agent for domestic purposes, independently of the necessity for employing a skilful mechanic (causing a further expense) to superintend the use of such an apparatus; indeed, steam boilers of more than four pounds pressure on the inch, should not be used for any domestic purpose.

The following sketch, given by TREGGOLD, will illustrate the arrangements of steam pipe usually employed soon after steam began to be employed for heating purposes. Fig. 17, Plate 2, is a longitudinal section, and Fig. 18 a transverse section: three of the pipes traverse the whole length of the closet, and three are placed between the two horses. The fresh air is admitted near the bottom, passes over and between the pipes, through the horses, and escapes with the vapour by the ventilating tube, which should be provided with a valve, as before described. The steam pipes between the horses lessen in diameter as they approach the top, the heat not being required there of such a raised temperature. A division, *g g*, is placed extending within a few inches of the roof; slits or apertures are left at each side, along the whole length of the closet; these slits are narrowest in the middle, where the influence of the ventilation is strongest; and broader towards the ends, where it is weakest: the steam and heated air pass through these, along the upper side of the division, and out at the ventilator. To allow of expansion, the pipes should be placed on rollers, as shewn in the drawing, and in the article HEAT. "The great advantage of this form of drying closet consists in confining the heat entirely to the substances to be dried, and consequently saving fuel; in keeping the laundry free from damp air and oppressive heat; and in rendering less space necessary. In this method of drying, the persons who are engaged in managing the process are not at all incommoded by the heat, nor by the steam from the wet cloth. For domestic purposes, there will be quite as little expense in fitting up an apparatus of this kind, as the commonest in use. One of the boilers in the wash-house will answer as a steam boiler, without rendering it the less fit for other purposes; those heavy and dangerous frames, usually employed to hang the clothes upon, will not be at all wanted; nor nearly so large a room for the laundry. And it is not an inconsiderable recommendation to this plan, that an immense quantity of fresh air will have to pass through among the linen while it is drying, which must render it more pure and fit for use."—TREGGOLD, *Warming and Ventilating*, pp. 259, 309.

Steam as a drying power has been largely used in this country, and in many cases on an extensive scale. The following figures are reduced from the working drawings of a drying closet fitted up at the Lancaster County Lunatic Asylum, which dries the linen, bedding, etc., of from seven hundred to eight hundred persons. Mr. Walker, of Manchester, was the designer of it. Fig. 19, Plate 2, is the ground-plan, shewing arrangements of pipes, which were originally fitted up as indicated by the dotted lines, and found to be very deficient in heating powers. The range marked *g g* was added. Fig. 20 is a plan shewing the position of the pipes placed between the horses, and Fig. 21 is a transverse section, of the manner of arranging these pipes in inclined pairs. The scale is one-twelfth of an inch to the foot. The cubic contents of this closet are 5,040 feet: constant ventilation of 288 square inches, or two square feet, is provided; with means of increasing it in moist close weather. The textures dried are unusually thick and heavy, and not easily wrung by female hands; and hold on the average twice their own weight of water when placed in the closet, thus: weight of a dry rug, 4½ lbs., wet 13 lbs.; weight of wet clothing dried daily in twelve hours, 4,006 lbs.; water evaporated in same time, 252 gallons; temperature  $120^{\circ}$  when the clothes are put in, increasing to  $170^{\circ}$  when dry.

It is almost unnecessary again to repeat, that in many drying closets, evaporation has been found to be greatly accelerated by increasing the rapidity of the heating current,

thus producing an effect equivalent to the action of a high wind, in drying in the open air. This acceleration has been effected by the use of fanners, screws, pumps, etc., worked by a steam engine or other power. The new process of drying (introduced by the Desiccating Company) by Messrs. Davison's hot-air patent, is on this principle, and is perhaps the most effectual method yet introduced. The process can be regulated with the utmost nicety, and is applicable with equal ease to a drying closet, the cubical contents of which is 30,000 cubic feet, as to one of 300; but it requires machinery to keep it in motion. It is the same as that described in the article *HEAT*, at p. 10, as a series of tubes formed into a cockle of a semicircular or horseshoe form, placed over a fire, with a fan attached to the lower part of it propelling air constantly through the series of pipes forming the cockle, sweeping the heat from the internal parts of the cockle into the drying chamber. The use of the fan is to compel a current of air to pass into the chamber, independently of the natural system of ventilation caused by the difference of specific gravity of heated columns of air, which would appear to be unnecessary, seeing that by a properly-constructed air-flue, a ventilating current can always be provided. The system can be applied to some manufactories where the drying chamber is by no means air tight, so that without the force of the fan or other power being applied, the heated air would not find its way to all the corners of the chamber, but escape at the nearest openings. As the fan cannot be worked without a steam engine, or some other equivalent moving power, this fact would appear to limit its usefulness: it might also be apprehended that a fire sufficient to give the required heat, when the fan was blowing air through the pipes, would be liable to destroy them when the operation of the fan was suspended; but no doubt this contingency is provided for: and there is no question but that this system will be found a most efficient means of desiccation for many purposes.

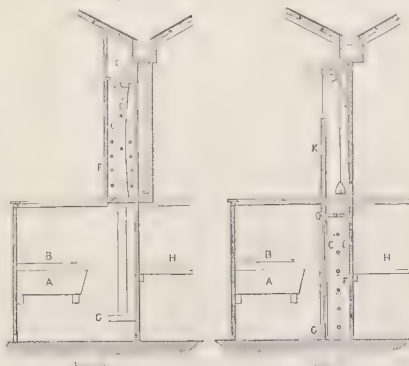
The most striking advantage obtainable by the use of this process for the purposes of drying linen, either in private houses or public establishments, is, the immense quantity of fresh air which is forced through and among the articles to be dried. For linen in hospitals, etc., where it is likely to be infected, we conceive the process to be invaluable. On this point, Dr. COPLAND, in his *Medical Dictionary*, vol. ii, p. 245, thus writes: "In all cases where the clothes, linen, and bedding are infected, or even suspected, disinfecting agents should be applied to them. Of all disinfectants, high ranges of temperature are the most efficacious; and the best method of employing a high temperature, with the view of decomposing the morbid effluvia retained by the bedding or clothes of persons who have laboured under pestilential and infectious maladies, is that invented by Messrs. Davison and Symington, who recommend the transmission of air through a chamber in which those articles are suspended; the temperature of the air being raised to grades varying from 200° to 250° of Fahrenheit. The advantage of this method is, its easy applicability to all kinds and to any number of objects and articles, without injury to their textures or fabrics." As a proof of the beneficial effects of currents of highly heated air in disinfecting clothes, the case may be cited which was tried in Syria; the clothes of sixty persons, who had died of the plague, were subjected to currents of air at a temperature of 240° Fahrenheit; these clothes, thus purified, were worn by sixty persons, not one of whom caught the infection.

Fig. 22 is a section of a drying closet for calico printing; the heated air is sent from the furnace by the power of the fan through the pipe *gg*, gaining access to the room by the apertures as shown. In drying closets for yarns, the saving of fuel is most important. In a chamber, the cubical capacity of which was twenty-two thousand feet, five thousand pounds of bleached linen yarn were hung; the moisture of which was nearly of equal weight (four thousand two hundred pounds of pure water). The apparatus completely dried the above

quantity in nine hours, the average temperature being 110°, the quantity evaporated being at the rate of four hundred and sixty-six pounds per hour. The quantity of fuel (Scotch) consumed per hour under the apparatus, is one hundred and twenty-eight pounds, being one pound of coal for every 3·64, or upwards of three and a half pounds of water evaporated. The small engine which worked the fan, consumes about sixty-four pounds of fuel per hour, which, added to the former, shows that 2·42, or say, two and a half pounds of moisture, is expelled for every pound weight of fuel used.

The process is also easily applicable to large drying closets as generally constructed, with movable horses. A modification of the arrangement shewn in Fig. 23 would be very efficient; *g* would form the hollow space beneath the rails *b b*, the horses occupying the chamber *h* above them; the ventilator to be opened and shut by means of a chain. The illustration shews the application of the process to the drying of grain or seed; the floor being formed of perforated tiles, or plates of cast iron. The next diagram, Fig. 24, is a representation of a fire-proof building to be used in connection with the above plan, for the drying or desiccating of timber: *g* are the brackets or supports on which the timber to be dried is placed; the hot air passing up through between them on its way to the ventilator *f*. The walls are made hollow to retain the heat.

The power of drying quickly and conveniently, is found to be of the utmost importance in public laundries, in order to save the time of the washerwoman: to enable her to dry one portion while her time is occupied in washing another, she should have a drying closet to herself close at hand. By such an arrangement, her feelings of self-respect are not violated by the necessity of exposing her humble attire to the view of others in one large closet, to which all persons using the laundry would be compelled to have recourse. Mr. Baly, at the St. Martin's Baths and Laundries, at Hull, Bristol, and other establishments erected under his direction, has managed this very happily. At the first mentioned place, the woman has simply to draw down a clothes rack, having weights sufficient to counterpoise it and the clothes; the which clothes, after hanging in the closet a few minutes, are found to be sufficiently dry. The heating pipes are arranged according to Fig. 25.



A, the washing tubs; B, the dripping board; C, the closet; D, the horse; E, ventilator; F, the pipes; G, the stop to receive the horse; and H may be either another washing place, or the ironing board, etc.

At the Hull and at the Bristol laundries, the closets are by the side of the washing tubs, instead of being above. In Fig. 26, the clothes are thrown over the pipes, so that the whole action of the heat is exerted within the drying material; a kind of saddle of wirework or open zinc is placed over the pipes to protect the clothes from contact with them, and the things are found to dry in a surprisingly short space of time. The letters of reference are the same as those of Fig. 25, and K is the door



which lifts up and down, having a balance-weight attached. To one range of seven sets of wash-tubs, there are as many sets of drying closets, each separate and distinct.

This plan is peculiar to Mr. Baly, and reflects much credit on his powers of arrangement. In the closets, a heat of  $200^{\circ}$  may be constantly maintained; great difficulty was found in providing an efficient and uniform mode of heating them. Steam pipes were first applied, with very considerable pressure of steam, probably twelve pounds on the inch; they were found to be quite ineffectual, precisely from the reason before assigned; as it is impossible to obtain a temperature of  $200^{\circ}$  from steam pipes a little above  $212^{\circ}$ , and that with ventilation. A stove with heated flue-pipes was also tried, which also failed, from the fact that heat evolves or is radiated from hot bodies as the square of the distance, and is only diverted from this by currents. In these experiments the first closet was overheated, the second tolerably well, and the third very imperfectly; but upon the application of the small pipe principle, the heating was found particularly efficient and uniform. The apparatus employed is that described Fig. 13, Plate 1.

If the reader will refer to the description of the several means of producing heat set forth in this article, it will be clear to him that any required temperature for desiccating purposes between  $80^{\circ}$  or less, and  $1000^{\circ}$ , may be accomplished, by using the one best adapted for his purpose. Of the various kinds described, that of the hot-water apparatus may be applied to

the drying of gunpowder, or almost any other inflammable material; as the boiler and fireplace, at which the heat is generated, may be placed a mile away from the drying room, if such a precaution were considered desirable; and the heating pipes could be completely insulated from the boiler by means of the intervention of cisterns, and the connecting-pipes coated outside with nonconducting substances. By means of a thermometer sympathising with the heated water in the pipes, any precise temperature may be ensured within the limits of the heat of this description of heating apparatus. The dreadful and unaccountable explosions which occur at powder-mills, suggest that every available means of precaution should be taken with this branch of manufacture.

The drying apparatus used for manufacturing purposes are so numerous, that it would be an endless task to suggest or to describe them further than has been done. From those which have been described, manufacturers would find no difficulty in selecting the plan best adapted for the especial purpose, or finding competent mechanics to construct a suitable apparatus. It is the besetting error of inventors, like vendors of some universal panacea, to fill the minds of the public with their nostrums, making them believe their peculiar apparatus is everything for all purposes; whilst the regular practitioner, with sound judgment, selects the proper material for the required purpose.

WILLIAM HEALY.

In drying closets for chemical and pharmaceutical purposes, there are some requisites which may in other processes be overlooked. The substances to be dried are various, as herbs, etc., which by a high temperature would be liable to injury, and yet would spoil if not perfectly dry. Extracts also require the greatest care to prevent injury from over-heating. Other substances again, as salts, from which it is required to drive off the water of crystallization, demand a high degree of heat. It should therefore be in the power of the operator to maintain a temperature of  $100^{\circ}$ , or even less, and to increase it at pleasure to as much as  $250^{\circ}$ ; but whatever is the degree required, it should be preserved without much variation.

Figs. 27 and 28 shew the section and plan of a closet adopted



Fig. 27. Section.

by Mr. Redwood, Professor of Practical Pharmacy to the Pharmaceutical Society, and which has been found to answer well. The closet is of brickwork, with a closely fitting iron door. Where it adjoins an outer wall, or one liable to damp, it should be lined with zinc, leaving a space of half an inch between it and the wall. Light is admitted by apertures closed with fixed plates of thick glass.

The furnace, *a*, is of iron,

enclosed in an air chamber, *b*, communicating with a square pipe *c*, the length of the closet, and terminating in an upright

pipe reaching to within two inches of the ceiling. The smoke flue, *d*, passes through the horizontal portion of this pipe, and enters into the chimney. The ash-pit door, as well as that of the furnace, are closely fitted and kept shut; the fire being supplied with air *entirely* from the closet, the quantity in which is kept up by the admission of it through the before-mentioned air pipe and chamber, which last communicates with the external air—by this means ventilation is constantly carried on; the heated air diffusing itself through the trays as it is drawn down into the opening *e* of the ash-pit. The degree of heat is regulated by a damper in the flue, and the ventilation by a similar damper in the upright pipe.

A closet on a smaller scale, according to the size of the trays required, is shewn in Fig. 29. It may be of wood lined with zinc, having a cavity of half an inch between it and the wood casing. The shelves for trays are to be placed alternately, the door fitting close to their front edges, so that the heated air must pass over the whole of them in its passage from the entrance *a* to the exit *b*. The ventilation is provided for by a double flue, as shewn in Fig. 3, and the air heated by a chamber attached to the furnace used for the general purposes of the establishment.



Fig. 29. Section.

It would seem preferable, however, in all cases, to make use of hot water, from the greater facility for accurately regulating the temperature, and the small pipes on the high-pressure principle must of course be adopted, on account of the high degree of heat sometimes required.

J. B.

DRYING CLOSET.

Plate 1.







# DRYING CLOSET

Fig. 2

























